COMPRESSED AIR MAGAZINE

DEVOTED TO THE USEFUL APPLICATIONS OF COMPRESSED AIR

Vol. xxii DECEMBER, 1917 No. 12

OVER 15,000 COPIES THIS ISSUE

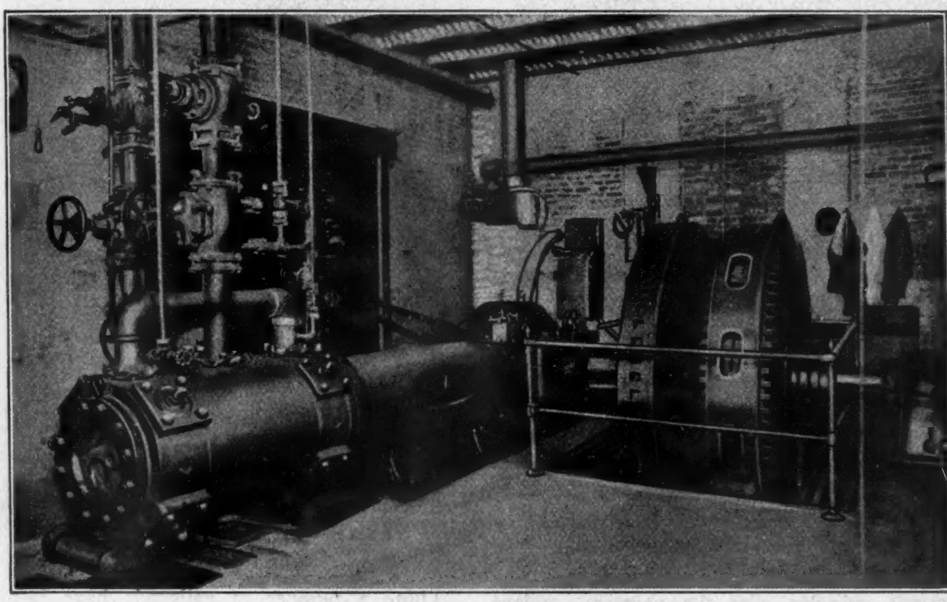
Published by THE COMPRESSED AIR MAGAZINE CO., Easton, Pa

NEW YORK, Bowling Green Building LONDON, 165 Queen Victoria Street

Classified Buyers' Guide, Page 14. Index to Advertisers, Page 11.

COMPRESSED AIR MAGAZINE
EVERYTHING PNEUMATIC

Vol. xxii. DECEMBER, 1917 No. 12.



AFTER THE TRANSFORMATION

STEAM ENGINE AND GENERATOR TRANSFORMED INTO MOTOR AND COMPRESSOR

It is becoming quite difficult to find in the whole "civilized" world any human activities which have not been greatly affected or entirely transformed by the ramifications of the world-war. The half tone above, here reproduced from Electrical Review, Oct. 27, tells the story of the transformation of a brewery into an ice making plant and of the complete reversal of function of the power apparatus.

The brewery of the Gottlieb Brewing Company is on Alexander Street, Chicago, On one side of the street is the malting house, still in operation, the malt product being sold to other breweries; the old brewery building now utilized for ice making, is on the opposite side of the street.

The change at the brewery, to adapt it to ice-making, was made last winter. About two years prior to this, however, the entire industry, malting and brewing, was completely electrified. Power for this was provided for by installing two steam-driven generating units in power house of the brewery building. Within the last year it was decided to purchase electric power from the Commonwealth Edison Company, and to dispense with steam power for every purpose except heating.

The two alternating-current generators were rewound so as to convert them into synchronous motors, and the two steam engines, by which the generators had tormerly

been driven, were converted into ammonia compressors for ice-making.

Further details of reconstructing this part of the plant are as follows: One of the generators, a General Electric alternator, was made over into a synchronous motor by giving its rotor the requisite winding, and by furnishing the necessary parts on the switchboard to adapt it to the change; also, an additional oil circuit-breaker, with mechanical interlock, was put in. The motor, thus produced, is a 200-kilowatt, 240-volt, 480-ampere, three-phase, 60-cycle machine, with speed of 200 revolutions per minute. Belt-connected thereto is a 20-kilowatt, 125-volt, direct-current Fort Wayne exciter set.

The other generator, a Westinghouse alternating current machine, was rewound in a similar manner to convert it into a synchronous motor of 250 kilowatts, 240 volts, 600 amperes, three-phase, 60 cycles and 200 revolutions per minute. A Westinghouse exciter, belt-connected to the large motor, is a 20-kilowatt, 125 volt, 160 ampere generator, running at 200 revolutions. At present the motors are started on half-voltage taps of the main supply transformers, without the use of separate compensators.

Each synchronous motor is direct connected to an ammonia compressor which is the product of the reconstruction previously mentioned. The change consisted in taking the steam cylinder off the engine and putting in place of it a De La Vergne ammonia compressor cylinder with the necessary valves and piping equipment. The remainder of the engine—piston rod, crosshead, guides, connecting rod, crankshaft, fly wheel, bed plate, foundation—remained intact. The two ammonia compressors, thus provided, have capacities of 140 tons each, computed in tons of refrigeration.

AN EIGHT INCH WELDED GAS MAIN

The street department of the East Ohio Gas Company recently laid an 8 in. welded steel gas main on what is known as South Rocky River bridge. The county is altering this bridge which gave an opportunity to lay the pipe on the cross supports of the new walk. The work was done in record time on account of the ease of access. The length of 8 in. pipe crossing the bridge was 1,300 ft. and three expansion sleeves were inserted.

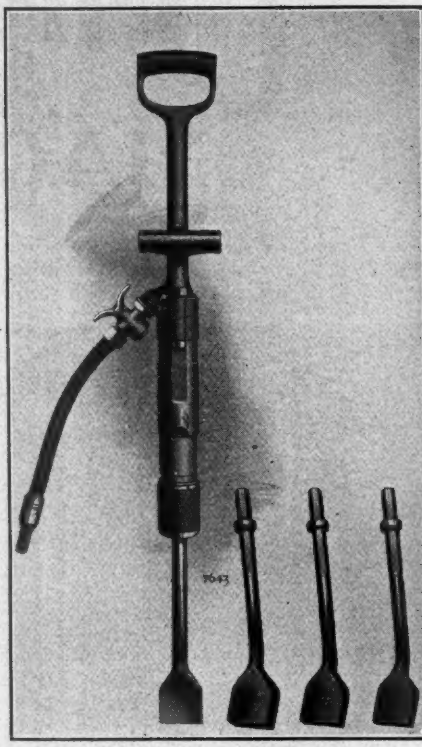


FIG. 1

PNEUMATIC TIE TAMPING ON THE DELAWARE, LACKAWANNA & WESTERN R. R.

Quite a number of railroads have introduced power tamping tools into track work somewhat extensively, among these the New York Central R. R., the Lehigh Valley R. R., the Pennsylvania R. R. and the Delaware Lackawanna & Western R. R. The road last named now has its track equipped with pneumatic tie tamping machines from Binghamton to Buffalo, N. Y., a distance of 203 miles.

On this stretch of road alternate sections are equipped with tamping tools and a machine for operating four of these tools, commonly known as the "four-tool" type of machine. With this arrangement two adjacent sections alternate in the use of the machine for tamping ties in track surfacing, one of the sections using it for that purpose while the other one is renewing ties, cutting grass or other work. By such an arrangement in the distribution of work between the sections

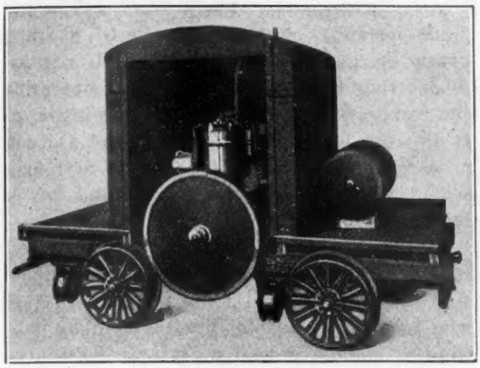


FIG. 2

one machine and outfit can conveniently serve two sections, and be shifted from one to the other, as needed. On the stretch of road named there are now 30 machines at work, and orders have been placed for 25 additional machines for equipping other parts of the D. L. & W. R. R. system.

The tools used for this work are known under the trade name of the "Imperial Pneumatic Tie Tamper," made by the Ingersoll-Rand Co., shown in Fig. 1. The tool complete weighs 37½ pounds, and with tamping bar inserted the length is 3 feet 10 inches. The air inlet is ½ inch in diameter, and the tool is fed by ¾-inch hose. The tools are designed for operation normally on air at 65 to 80 pounds pressure per square inch. The amount of air consumption, at 70 pounds pressure, is 16 cubic feet per minute.

For work in different kinds of ballast there are four tamping bars of different thicknesses, all being 18 inches long. That for broken stone ballast of 2-inch size or larger has a tamping face ⅝x3 inches. For rock ballast finer than 2 inches, washed gravel and slag, the tamping face is ⅞x3 inches. For cinders, earth, gravel, sand or chatts, the tamping face is 1⅛x3 inches. Each tamping outfit consists of tampers, a power machine, and hose connections.

What is known as the machine or power plant consists of a gasoline engine and an air compressor mounted upon a heavily constructed vehicle of the push-car type. A view of the machine is seen in Fig. 2, this being the "Imperial" gasoline-engine driven tie tamper compressor, four-tool type. The gas power cylinder and the air compressor cylinder are connected to a double-throw crank shaft. To insure correct and permanent alignment the cases which carry the crank shaft bearings are mounted on a machined sub-base. The gas cylinder is of the two-cycle type and an automatic governor controls the speed by acting on the throttle which forms a part of the carburetor. The air compressor is of the single-stage single-acting type, with inlaid valves seated on the piston and Ingersoll-Rogler discharge valve. Both cylinders and cylinder heads are thoroughly water jacketed, and a water circulating system with radiator and high speed fan, of automobile style, form a part of the outfit. In the discharge line between the air compressor and the air receiver there is a pressure-operated unloading device which automatically controls the pressure in the air receiver, keeping it within desired limits.

This compressor outfit is self-propelled, by means of a sprocket chain which can be thrown into gear by means of a clutch connection with the main shaft. The general method of operating the equipment is to set off the car, using 4x5-inch timbers faced with strap iron or light-weight rail as a cross track for the car, and rolling it onto a prepared stand made by setting four posts in the ground and cutting them off at the proper level, or on a crib of ties laid on the ground or shoulder of the roadbed at the point where it is desired to remove the car from the track. As the weight of this outfit is 3,300 pounds, jacks are used,

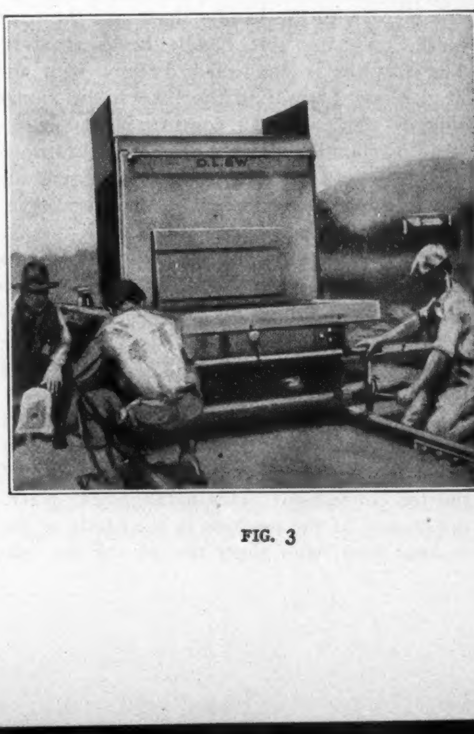


FIG. 3

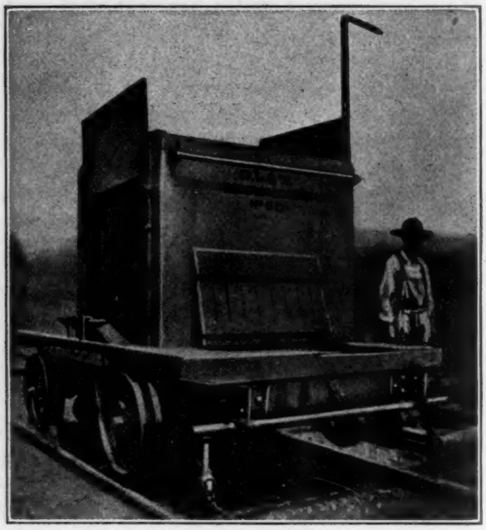


FIG. 4

Fig. 3, to lift the car far enough from the track rails to insert the cross rails underneath the auxiliary wheels, which, as will be noticed, are set at right angles to the track. Fig. 4 shows the compressor car supported on the cross rails ready for removal.

The car is made with a light sheet steel cover, which serves to protect everything from the weather and the heat of the sun and detachable doors are furnished for locking up when not in use.

The pneumatic tamper, Fig. 1, is made in one piece with the handle shaft and the head block, only the side handle being separate. The throttle is connected directly with the head block, permitting the hose to lie alongside of the tool at a comfortable angle instead of standing straight out. The throttle is of the two-wing balanced type, obviating the possibility of being closed by the vibration.

For each pair of tools there is a 300 ft. length of ¾ in. hose, made up of 50 ft. lengths with a ¾ by ½ in. tee, and two 12 ft. lengths of ½ in. hose connecting the tamper with the standard hose. In a four tool outfit this arrangement is duplicated, so that each pair of tampers works on an independent hose line.

For terminal work or where trains are operated at close intervals an automatic air valve can be placed in the line just ahead of the tee connection. This arrangement places the control of the machine in the hands of the lookout man, who shuts the air off the machine instantly on the approach of a train, giving the operators due warning. Under ordinary conditions, however, the man operating the compressor is supplied with a whistle, as is also the foreman of the gang, and as soon as a train is seen to approach the first man seeing the same blows his whistle and this is repeated by the other.

By the system in vogue on the D., L. & W. R. R. the compressor plant and car are operated by a man picked from the section crew who may show adaptability to handling machinery, and he is paid 2 cents an hour over the wages of the common section laborer.

The tamping tools, as in Fig. 5, are used by ordinary laborers, and they work their way down to the bottom edge without removing the ballast from the side of the tie, as is necessary in hand tamping. In its work the tool breaks up the old bed under the tie in about the same manner as the work proceeds with the use of hand tamping picks. It is the observation of the foreman that these power driven tools do the work more thoroughly than it is usually done with tamping picks or bars in the hands of the average track laborer, and the laborers prefer these tools to hand tampers for ease of handling. There is no difficulty in holding the tool to tamp directly under the rail seats, and about switch and turnout rails, frogs, and other cramped quarters.

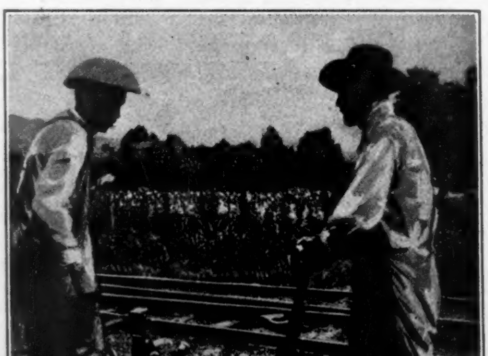


FIG. 5

The operation of the pneumatic tampers is not only more efficient but is also more expeditious than that of hand tools. A test of rate of work and costs by the two methods was made last year, in which the results of the work of five section crews at hand tamping were carefully observed and recorded for a week, as against the average results from the operation of five of the machines in regular operation. The work was in broken stone ballast, and the average cost per tie in hand tamping was 9.2 cents, whereas the average cost per tie tamped with the pneumatic tools was 5.97 cents. In the latter figure the items of fuel, repairs, wages of machine operators and foremen were taken into account, but not the overhead expense.

In all the work that is done with these pneumatic tampers accurate record of the matters of expense is kept and regularly reported, printed cards being provided for the records.

The average consumption of gasoline in the operation of a 4-tool outfit is about 15 gallons in 9 hours. It is found that with all crews the consumption of gasoline decreases as the men become accustomed to the work.

Near Hoboken, at the eastern end of the system, the air pipe lines about the terminals are availed of as the source of energy for operating the tampers, in which case, of course, no portable compressor plants are used.

At one place, near Waverly, N. Y., where there is a high fill about ¾ mile long, with shoulder width too narrow for conveniently setting off the machines without considerable preparation, an iron pipe line 1,000 ft. long is used to transmit the air. This suffices for power distribution in working over 1,500 ft. of track (double track). After such a stretch has been finished the pipe is uncoupled, in 100-ft. sections, and dragged along to an additional stretch of track, to repeat the operation. The pipe used is 1½-inch, but this has been found unnecessarily large for a 4-tool outfit.

In the development of the use of pneumatic tampers on this road, Mr. George Lowe, supervisor, at Elmira, N. Y., has taken a leading and enthusiastic part, and many improvements of machinery and method have been adopted as the result of his studies of the work. We are indebted to Chief Engineer G. J. Ray and to Mr. Lowe for an opportunity to observe the practical working of this means of saving labor on track.—*Condensed from Railway Review.*

FLYING IN CLOUDS

Personally, I seldom use an instrument as an assistance to piloting. Do not assume that I am sneering at instruments; in fact, as I have stated, there are times when they are a necessity. In fact, I am going to suggest that one instrument be fitted as a standard equipment, an instrument to reduce the risks connected with flying in clouds. It may not generally be known that there have been such a large number of fatal accidents during the last three years entirely due to flying through clouds, and I consider this subject wants going into pretty carefully.

The accidents to which I refer have not been questions of a want of height; the machines, have become hopelessly out of control. I will give you an instance which happened to myself a few weeks ago in the west of England. You will then realize why I consider this is a serious matter requiring particular attention.

I set out on a very cloudy, windy day to do a test climb to 10,000 feet on a late type two-seater. I had so often on previous occasions succeeded quite comfortably in reaching this height in spite of cloudy, overcast days by pushing up through the clouds, usually only a matter of a few minutes, into bright sunlight and the bluest of skies, and after reaching the desired height, coming down again through the clouds, having flown by compass and time.

On this particular day, however, the wind was very gusty, and on reaching 1,200 feet we got into dense rain cloud, but carried on to beyond 5,000 feet, still in the cloud, when the compass apparently began to swing (really it's the machine that begins swinging, not the compass). Efforts to check the compass had the effect of causing it to swing more violently in the other direction.

The air speed then rushed up far beyond normal flying speed; all efforts to pull her up checked her only slightly; then the rudder was tried, back went the air speed to zero; there was an unusual uncanny feeling of being detached from the machine, and I knew her to be literally tumbling about in the clouds. All efforts to settle down again to a straight flight seemed to be unavailing, until we emerged from the cloud very nearly upside down. Assuming control again was then an easy matter.

This sort of thing has happened to me more than once, and, in the Flying Corps vernacular,

"it puts the wind up you." And it has happened many times with other pilots. In some cases they emerge from the clouds in a spin, others are known in which the planes have collapsed under the strain of the sudden pull-up from the vertical nose-dive.

A few days ago, a squadron commander told me that on one occasion when in France everything loose in his machine fell out while in a cloud. A week or so ago, on the South Coast, a machine disintegrated in a cloud and the main planes landed half a mile from the fuselage. From my own experience, this is a very unpleasant state of affairs, and in consequence I avoid clouds when possible.

Let us try and examine the cause of this. First of all you must realize that in a cloud you see nothing whatever but your machine around you. There is no fixed point visible. The only means by which you can tell if you are flying in a straight course is by your compass and your air speed. The compass should give you your direction horizontally, your air speed your direction vertically.

The first thing that happens, and very readily too, if windy and bumpy, is that your compass card will begin to move slightly. It really appears to you that the compass was suddenly affected by the cloud, and you are flying straight ahead. How often you hear a pilot say that as soon as he got into a cloud his compass started spinning. The moment the compass starts moving it requires extremely delicate ruddering to get it back to a steady position; in fact, one invariably over-corrects the compass movement, and so the trouble begins.

Once the compass starts on a good swing I have found it nearly an impossibility to get it steady again until out of the cloud. Before your compass starts to move, your machine has already started to turn. You rudder the opposite way to check it, over-correct it, and turn sharper the other way on to a banked turn; then the nose drops and speed goes up. Pulling back your elevator-lever has little or no effect, for if you are banked above an angle of 45 degrees the elevator becomes the rudder. All this occurs without the pilot being in the least bit aware of the position that his machine is taking relative to the ground. The instruments available are of little service once he loses his control.

Of what use is his air speed indicator to him indicating 150 m. p. h. if the machine is on a spinning spiral, and he imagines that he is merely descending too fast on a steep, straight glide? He naturally tries to pull up, but with no effect. The bubble does not help him, as centrifugal force will send that anywhere.

It may be argued that if a stable machine is left alone under these circumstances it will right itself eventually and assume a normal glide. It very likely would if the pilot could steel himself to let it entirely alone, but before it did so it would have to be left to do a sheer vertical nose-drive for some moments, and in these days of big weights and little head resistance one is liable to attempt to pull out too suddenly from the dangerous high rate of speed attained on this dive. What I want to see fitted is an instrument which will show a constant vertical or horizontal line and be independent of centrifugal force.

I have no ideas upon the subject nor suggestions as to how this is to be brought about, unless something in the nature of a small gyroscope driven by an air-screw could be employed in some way to meet the requirements of flying in clouds, but until something is provided so that the pilot can see a fixed line, I think we shall continue to have accidents from this cause. —*Captain B. C. Hucks, R.F.C., before the Aeronautical Society, London.*

BLOWING DUST FROM MACADAM

In preparing macadam roads for the application of tar or oil, it is generally desirable to remove all dust from the top of the road to permit the bituminous material to penetrate the stone. Where a portable air compressor is available, this can be done by blowing it off; which is the best way, for it cleans out the upper interstices, while brooming only packs the dust into them. One plan is to attach to the end of the air hose a T-shaped set of pipes formed of a T and three pipes, a row of small holes being drilled in line in the two pipes that are fastened in line in the opposite openings of the T. This set of pipes is held in the hand or may be fastened under the wagon carrying the air compressor so as to come an inch or two above the road surface and with the air jets making a slight angle with the vertical, blowing the dirt in the direction in which the wagon is moving.—*Municipal Journal.*

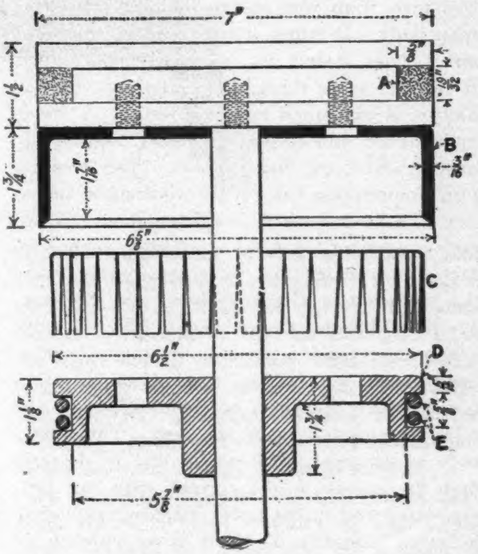
COMPRESSED AIR IN FRENCH TRENCH MORTARS

A goodly portion of the French trench mortars of today are of the compressed-air type. Instead of the usual powder charge, they make use of a puff of air or gas to propel the aerial torpedo or land mine through the air and into the German trenches.

After a lapse of some thirty years, the revival of the pneumatic cannon is apt to be hailed as a brand new idea. As a matter of fact, however, the idea is anything else but new. In several of his campaigns Napoleon encountered Austrian troops equipped with pneumatic rifes, and he is said to have seriously considered this type of weapon for his men. At various times during the nineteenth century, the idea of pneumatic cannon was suggested, and in several instances full-sized compressed-air artillery was actually constructed and tested. But with the introduction of modern explosives and propelling powders, the pneumatic cannon was laid aside as an impractical weapon. The present-day trench warfare caused the pneumatic cannon idea to be brought out into the open again, worked upon, and then introduced in the form of a highly-perfected trench mortar which meets all the peculiar requirements of the intrenched warriors.

In the present pneumatic trench mortar the propelling charge is supplied either from a tank of compressed air or gas, such as carbon dioxide, or from a tank which is charged by means of a hand-pump. In either case the tank can be used for a number of rounds before it is recharged, since only a puff is necessary to eject the projectile. In the case of the hand-pump type, 200 or 250 strokes of the pump handle are sufficient to produce a pressure of eight to ten atmospheres in the reservoir, which, in turn, is sufficient for a number of rounds. The apparatus which releases the puff of air is operated by means of a trigger or lanyard, and immediately following the release of the propelling charge an automatic valve shuts off the further escape of air or gas from the tank. Indeed, it is the mechanism which only allows a sudden puff of air or gas to be injected into the chamber of the cannon, behind the projectile, which presented the greatest problem in the development of this type of artillery.

It is reported that, aside from being silent and inexpensive of operation, the pneumatic mortar lends itself to ready manipulation. It can be handled at a fairly high rate of speed. Most important of all, however, is the fact that the aim of the pneumatic trench mortar is exceedingly accurate, provided the reservoir is not discharged below a certain point. Obviously, it is the short range over which the trench mortar must be operated, namely, 750 to 1,000 feet, which has made this form of pneumatic artillery a military success.—*Scientific American.*



AIR-HOIST PISTON PACKING

BY GEORGE W. BERSHEEE

The accompanying illustration shows a method of making an air-hoist piston and cup leather that will give good service. I have made many such for use in an iron foundry where the hoists are used to handle ladles of iron while "pouring off" machine floors. This service requires them to hold steadily at any height needed and subjects the hoist to considerable heat. The ring of square hemp packing *A* serves as a swab and distributes any heavy oil used to lubricate the piston and cylinder.

To assemble, slide the cup leather *B* into place, then the slashed sheet-iron disk *C*, and then the follow plate *D*, and tighten all with the cap screws. The ¼ in. spring rings *E*

should stand open ¾ in. when spread and the ends butt when closed. Slip these into the follow-plate groove behind the sheet-iron disk and they will keep the edge of the cup leather tight against the cylinder wall all around, and the air pressure will finish the job. The piston should then slip in easily.—*Am. Machinist.*

ARIDITY OF DESERTS AND OF SCHOOLROOMS

Schoolroom air may and does contain less moisture during much of the winter season than desert air, and also has a lower relative humidity, but it does not extract so much moisture from wet objects nor from the human body. In other words while schoolroom air is drier, desert air is more *drying*, which is not the same thing. The apparent contradiction is explained by the more active movement of air and consequent more rapid evaporation outdoors than indoors. The Ventilation Commission has been measuring evaporation in schoolrooms with a Livingston porous-cup atmometer, and the somewhat surprising fact was revealed that in certain rooms where the air is artificially humidified and the average humidity is 38 per cent., there is more evaporation and a greater drying power is exerted on the human body than in other rooms where the air is not humidified and the relative humidity is 28 per cent. The difference in apparent "dryness" is due to the fact that the rooms in the former case are fan-ventilated and in the latter window-ventilated. Relative humidity by itself is a criterion of neither dryness, nor dryingness, nor the sensation of dryness.—*Mr. George T. Palmer, American Society of Heating and Ventilating Engineers.*

VENTILATION AND TUNNEL PROGRESS

Dr. A. J. Lanza of the Bureau of Mines, in a paper at the recent meeting of the National Safety Council, cited an interesting example of the effect of poor ventilation on the efficiency of men in underground work. A mine, driving a long drift about 3,000 ft. below the surface, was paying $15 per foot, day's pay. The place was hot and moist. A small blower fan was installed at the entrance to the drift, with a canvas pipe leading nearly to the working face, and without any other change the cost was reduced to $6 per foot, day's pay. In shaft sinking this mine had made 50 ft. in one month and 60 ft. in another. A small blower with canvas pipe was installed and the next month 120 ft. was the progress made.

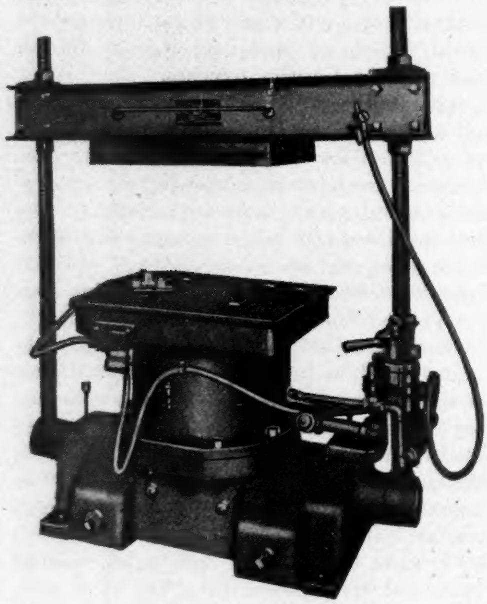


FIG. 1

POWER SQUEEZERS*

Different means have been employed to operate power squeezers and it has finally resulted in the almost universal use of compressed air for the purpose. Consequently, before installing power squeezers it is necessary to have an air compressor, the services of which will be required also for various other tools. The largest field for power squeezers is for work commonly known as bench work, for which they are specially adapted. The use of the power squeezer makes it easier to obtain and keep an operator as less physical exertion is required than with the hand operated squeezer.

Different types of power squeezers will here be spoken of in succession, beginning with the plain power squeezer with head swinging on rocking strain rods, Fig. 1. This machine operates practically the same as a hand squeezer excepting that the squeezing is done by letting air into the cylinder, thus forcing

*From Service Bureau Bulletin, No. 7, National Founders' Association.

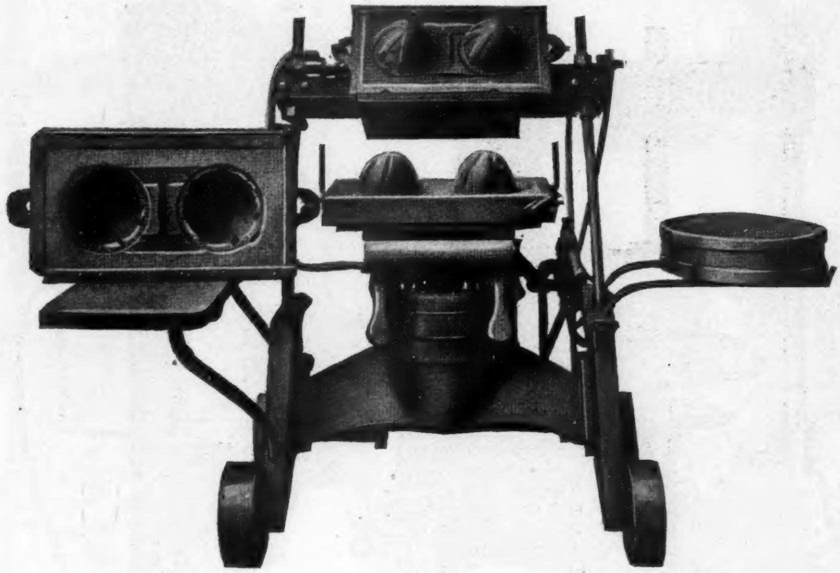


FIG. 2

the mold up against the head. The air cylinders are usually 10 in. or 12 in. in diameter. Machines of this type are designed to operate efficiently with 80 lb. air pressure. The air should be let into the cylinder slowly enough to avoid giving a ramming blow, as the steady squeeze is much better. After the mold is squeezed the air is discharged by a turn of the valve lever, and the table descends to its former position.

A modification of type one is the plain power squeezer mounted on wheels, with swinging strain rods, Fig. 2. This machine has the advantage of being easily moved from place to place in the foundry, and it can also be moved alongside the sand heap. The wheels raise the machine above the floor enough to allow space for the operator's feet and for him to shovel easily from under the machine. This machine is built also with straddle legs, Fig. 3, to enable the machine to work right over the sand pile, and is mounted on wheels so that it can be pushed forward as the floor is filled with molds. After pouring, the molds are dumped in a winrow and the sand is tempered and cut in this position for the next day.

The plain power squeezer with rotating head, Figs. 4 and 5, differs from type 1, in that the head swings horizontally out of the way instead of rotating on strain rods. The head is easily swung around into place. This type has only been in use a few years, but is meeting with considerable favor. The same pattern equipment is used on this type as on the type having the swing head on rocking strain rods, and the same comparative results are obtained. The pressing block has a steel adjusting screw permitting easy adjustment of the block to various depths of molds.

In the plain squeezer of the hinged head type, shown in two positions in Fig. 6, the head is made to swing back on a hinge or trunnion placed well above the level of the table. A strong, spring acts as a counterbalance to help carry the weight of the head. When pulled forward into ramming position

FIG. 3

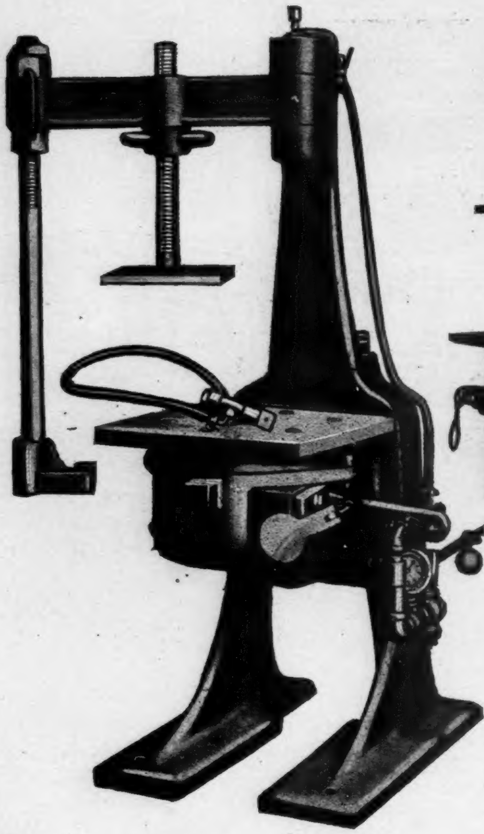


FIG. 4

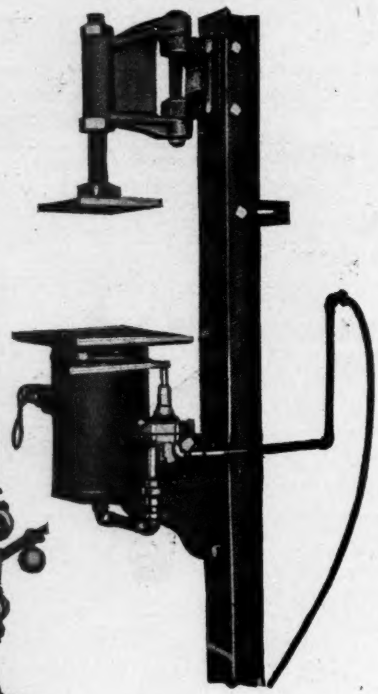


FIG. 5

the end of the strain rod falls into a lock to take its share of the ramming thrust.

Fig. 7 shows a plain power squeezer having a squeezer head operated by a compound toggle movement, the toggle mechanism being operated by an air cylinder, the machine being also provided with an air operated pattern drawing device. This machine is of more elaborate construction than those previously shown and has great adaptability. It can be used for aluminum match plates, hand sand matches, patterns on one side of the plate, on both sides of the plate, or for stripping plates.

The machine consists of a cast iron table to the frame of which is attached the pattern drawing mechanism. The tilting squeezing head is attached to a cast iron crossbar supported on rods fastened to the frame. The table is slotted to permit the passage of the pattern and flask lifting posts, and slots also are provided for the adjustment of the flask stops, which can be set for any flask within the capacity of the machine. These stops serve as guides for the operator, and after being set to the size of the flask locate the same on

FIG. 6

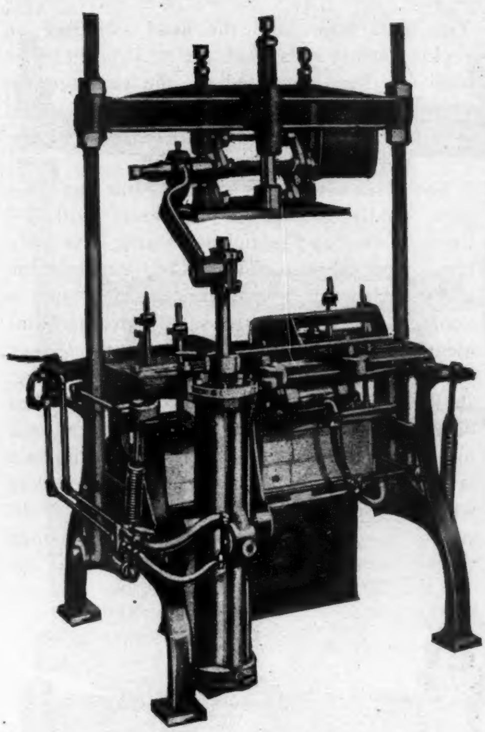


FIG. 7

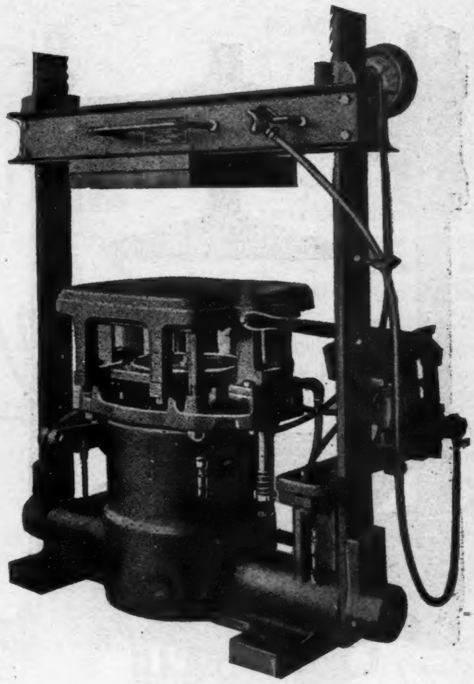


FIG. 8

the table in its proper position underneath the squeezing head. Liners also are provided for bolting pattern plates to the table. A vibrator, knee-operated, is attached to the machine.

The squeezing head has a compound toggle movement, reducing to a minimum the power required to press the mold. The greatest power is obtained at the point where the hardest pressure is required, and, as the toggles are self-releasing, it is impossible, after the head has been adjusted for the pattern to be molded, to press a mold harder than the density desired.

The head, it will be seen, is adjustable up and down. The tilting of the head is controlled by springs attached to the lower ends of the steel uprights and the frame of the machine. The lifting mechanism is controlled by the lever shown at the side, which is thrown over by the operator while vibrating the pattern with a knee valve. The post-raising lever is held until released by a spring latch.

The power squeezer, split pattern type, is built with heads of three different kinds: the head swinging on rocking strain rods, the rotating head type, and the head mounted on a carriage, the latter arrangement being

FIG. 9

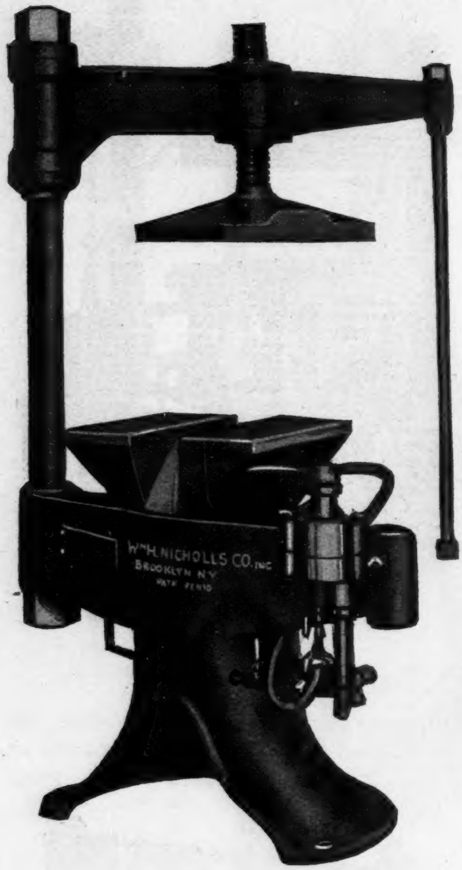


FIG. 10

shown in Fig. 8. This kind of machine has long been in use, and is one of the first types of power squeezers made. As its name indicates, it is used where the patterns are split and mounted on plates. Unlike the plain power squeezer operated with match plates, only one half of a mold is made at a time. They are extensively used in both iron and brass foundries, and are used with snap flasks or solid flasks. The machine is provided with a pattern drawing attachment, which operates to lift the mold from the plate. It is equipped with a vibrator attached to the frame or yoke which carries the pattern plate, so the pattern plate can be vibrated as the mold is lifted from the pattern. A blowoff valve also is furnished to clean the pattern plate or any part of the mold that may be necessary.

The power squeezer stripping plate machine, Fig. 9, is built with the head swinging on rocking strain rods, with the rotating head, or with the head mounted on the carriage; in fact any split pattern machine can be fitted with stripping plate patterns without difficulty.

JOLT RAMMING

The principle of jolt ramming the sand has been applied to power squeezers with all three of the head mountings which have been previously mentioned, Fig. 10 showing the rotating head. A machine of this type is adopted for use with the same pattern equipment as with the machines here first spoken of, and is particularly adapted for deep drag, shallow cope work mounted on plates. The drag is jar rammed first, the board is squeezed in place, and the cope is then squeezed but not jar rammed. This jarring principle does away with all tucking by hand, rams deep green sand cores perfectly, and produces castings true to pattern. The jolting increases the ca-

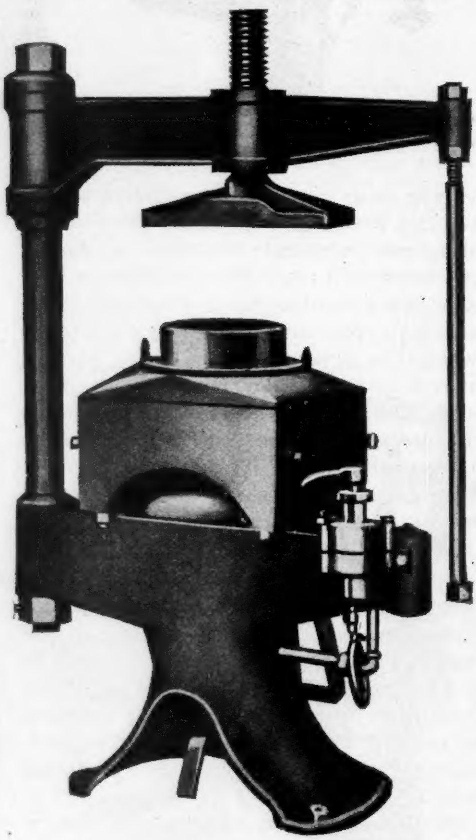


FIG. 11

FIG. 12

should be kept in good order, and that the pattern equipment should be such as to make a perfect mold.

Supplementary to the preceding we append the addresses of manufacturers of power squeezers as follows: International Molding Machine Co., Chicago, Ill.; The Berkshire Mfg. Co., Cleveland, Ohio; E. H. Mumford Co., Elizabeth, N. J.; The U. S. Molding Machine Co., Cleveland, Ohio; Federal Malleable Co., West Allis, Wis.; Henry E. Pridmore, 19th and Rockwell Sts., Chicago, Ill.; Federal Foundry Supply Co., Milwaukee, Wis.; The Tabor Mfg. Co., Philadelphia, Pa.; Davenport Machine and Foundry Co., Davenport, Iowa; Arcade Mfg. Co., Freeport, Ill.; The Osborn Mfg. Co., Cleveland, Ohio; Wm. H. Nicholls Co., 2-10 College Place, Brooklyn, N. Y.; The B. & B. Mfg. Co., Inc., Indianapolis, Ind.

pacity of the machine, as deeper flasks can be rammed than with a squeezer.

The application of the jolt ramming principle is a distinct advance, and nearly every one has now learned the many advantages of jolt ramming. This feature is added to the machine by the use of a valve which raises the table to a certain height when the valve releases allowing the table to drop and strike an anvil, or what serves as an anvil. Some makes of machines apply this principle by the use of a cylinder inside the ramming cylinder.

The power squeezer, jolt ramming, stripping plate machine is shown with the different head mountings in Figs. 11, 12 and 13. The machine has the combination of jarring the mold, squeezing the board in place and stripping the pattern, accomplishing all these operations in a rapid and efficient way. Castings of the most exacting character can be produced on this machine.

It should be quite superfluous to remark that to get the best results the machines

FIG. 13

SOIL AERATION AND PLANT GROWTH

Mr. A. Howard, Imperial Economic Botanist at the Agricultural Research Institute, Pusa, India, has made a study of soil aeration in agriculture, the results reached being embodied in a recent lecture. The proper aeration of the soil, in order to promote the growth of the soil bacteria which observation has shown to be necessary to the profitable production of our modern farm staples, cannot be too much insisted on.

It has often been noted that a newly dug ditch, with the earth thrown up on all sides, rarely shows any early growth of plant life on this newly thrown up earth, and this lack of growth has been attributed to the fact that the soil bacteria, so essential to plant growth, have not invaded the more deeply lying strata of the soil, and that the non-growth of plants, or at least a limited growth, on these ditch banks is attributable therefore to the non occupation by these bacteria of this newly thrown out earth.

WHEN WATER EXCLUDES THE AIR

Mr. Howard has found that a large part of the deficiency in plant growth under such circumstances may more properly be laid to the presence of water in the soil which occupies the interstices and leaves no room for the necessary aeration.

As India frequently suffers much from drought, the first outlook of the Indian agriculturist is to secure an adequate water supply for the production of crops. At the same time the water supply may readily overdo the needs of most kinds of plant life, drive out the air from the soil interstices, and leave the soil without adequate aeration for the support of plant life.

After ten years observation of the plants grown on the Indo-Gangetic alluvium, which has been closely correlated with experience at other leading points in India, Mr. Howard reaches the conclusion that a full supply of air is quite as important as a sufficiency of water. The argument is that the air is a necessary raw material for the soil organisms and for the roots of the plants wherever they may be grown. Soil ventilation is found in practice to be quite difficult on alluvial soils like those named over very large areas in the plains of India. These soils pack very readily and always run together on the surface after heavy rains, forming a well defined crust. They seem to entirely retain their porosity after long continued rains.

In an experiment made at Pusa in 1910 waterlogged soils indicated enormous losses in fertility. Waterlogged lands planted in wheat with the produce compared with that of normally drained plots, gave a yield of 16 bushels of wheat less to the acre. This was demonstrated as being largely due to denitrification following water loggings; as the increased yield obtained on a comparable stretch of land through the middle of the experimental plots when treated with 4 cwt. of nitrate of soda raised the yield in the water logged plot from 15.55 bushels of wheat to 25.17 bushels. On plots that were not water logged nitrate of soda indicated very little if any beneficial effect. It is claimed that defective aeration of the soil besides interfering with respiration of the active cells of the root and of the soil bacteria, exercises a profound influence on the development of the root system itself. The root system development of the cereals other than rice depend on aeration, and the illustration given with plants growing in jars of water shows at least a double growth of barley in a jar aerated once a day, while that aerated continuously filled the jar with roots, showing that this root development depended largely upon this aeration.

Immense quantities of linseed, or flaxseed, are produced in India and the plant is exceedingly sensitive to a wet subsoil and it wilts easily from these causes. In the experiment under consideration the subsoil at Bihar contained too much moisture and too little air, the reverse of the general conditions in the dry seasons. In such moist seasons flaxseed grown on lands subjected to the drying effects of the roots of leguminous trees does better than on ordinary land. The tree roots remove some of the excess water from the subsoil. Air then takes the place of this water and the roots act directly as aerating agents. Java indigo grown for seed often behaves in the same way. A similar state of things occurs in tea in Assam or Ceylon, where the best bushes are found on land within a radius of the action of leguminous tree roots.

Mr. Howard's conclusion is that in all such cases increased surface drainage is indicated as the best means of improving these cultures.

Some experiments with peach trees showed that the yellowing of the leaves was found to be reproduced at will either by deep planting or by over irrigation, both resulting in poor soil aeration. With improved drainage the affected trees changed into a healthy, vigorous condition in a single season and the death of certain experimental trees was pronounced to be the result of defective aeration of the soil caused by excessive surface flooding under arid conditions. About 18 million acres of the gram or chick pea crop are grown in India every year and it grows to the best advantage in well aerated soils and cannot be grown successfully under irrigation where flooding would destroy the porosity of the soil. It is found that where the soil is adapted to such culture it is porous and develops a large root system with the usual nodules for the nitrogen collecting bacteria. Java indigo cultivated in British India is a leguminous crop with root nodules. The slightest interference with the air supply of these plants makes itself manifest by leaf fall or by the shedding of the flowers without setting seed. If the air supply is partially cut off through any cause the plant loses a number of its nodules and feeding roots at once and it proceeds to adjust its leaf surface to the diminished root range. This goes on until finally death will take place, the branches wilting off in succession. The author says that wilt in indigo is the last phase of starvation of the plant.

The scarcity of synthetic indigo since the German supply has been cut off, has led to some renewed experimentation in the improvement of the indigo plant in British India. In recent years a quarter of a million dollars have been spent in indigo experimentation. It was found that the most efficient type of indigo for the Bihar conditions is to raise good seed and to see that the roots or nodules get plenty of air. The decay of the indigo industry is attributed to the gradually increasing high water level in those sections, this increase corresponding with the diminished air supply in the soil to the indigo plants. This rise in the height of the flood is attributed to the various embankments constructed in the country interfering with the free flow of the water into the great streams as was formerly the case.

As is well known in Louisiana, the rice crop can hardly be made to flourish without an adequate supply of water. It is true that by cultivation in rows or drills high land rice can be produced, but rice produced by irrigation is so much greater in quantity and thought to be better in quality that the high land rice is entirely neglected. Rice is said to be a plant that utilizes the oxzgen which is already dissolved in water and hence, fish-like as it were, it utilizes the oxygen in the water, while nearly all other industrial plants require the oxygen from the atmosphere which can only enter into the circulation of the plants through the roots and hence with sufficient soil aeration.

As collateral to these conclusions at the Bihar station reference is made to the Dutch planters of Java who have learned by long experience in the growing of sugar cane on heavy soils that there exists a close connection between the yield of sugar and soil aeration, and that the destruction of the porosity of the soil does great harm to the crop. Therefore in Java great attention is paid to the aeration of the soil on which that island and its sugar industry chiefly depend. In Java rice and sugar cane are grown alternately on the same land. Such culture demands irrigation and adequate arrangements therefor and also demands thorough drainage in order to secure aeration. Mr. Howard believes that they will have to adopt the Dutch methods in India if they expect to compete successfully with Java in sugar production. He holds that nowhere is better aeration for sugar cane so necessary as in Bihar and that the new seedling canes that are now attracting much attention in northern India cannot be developed satisfactorily unless the question of aeration receives more consideration than hitherto.

WAR EXPLOITS OF A MINING ENGINEER

One of the greatest of the exploits performed by a mining engineer was the destruction of the oil wells and stocks of oil in Roumania by Colonel Sir John Norton Griffiths. The details of this great adventure have just been published by the Roumanian Consolidated Oilfields, Limited, the largest of the English organizations interested in the Roumanian oil industry.

When Roumania declared war on the Central Powers in September, 1916, the oil indus-

try of the country was placed in the hands of a State Commission, and production was controlled according to public requirements. By the middle of November the danger of the Roumanian armies was recognized, and it became obvious that the advance of the Germans could not be resisted. The Commission immediately devised plans to prevent the stocks of oil falling into the hands of the enemy and to prevent the wells from being operated. The proposals embodied the plugging of the wells with plugs having a secret pitch of screw and taper, the removal of a few parts of the machinery considered vital, and the withdrawal of the oil from the storage tanks and reservoirs to spots where it could be burnt without damage to tanks or buildings. The idea was to do the least permanent damage to the properties, and to trust that the invaders would be sufficiently inconvenienced thereby.

This policy was pursued in a rather dilatory and inefficient manner for a few days. On November 25 the sudden appearance of Colonel Norton Griffiths at Ploesti caused much commotion in official and commercial circles. He announced that he had been sent by the British Government to help the Roumanians to destroy the oil wells and stocks of oil, and that he had so far received no assistance from the authorities or the owners of the properties. As the matter was desperately urgent, he took a strong course, and proceeded with a plan to destroy everything absolutely. Many and stormy were the interviews between him and the Roumanian Commission.

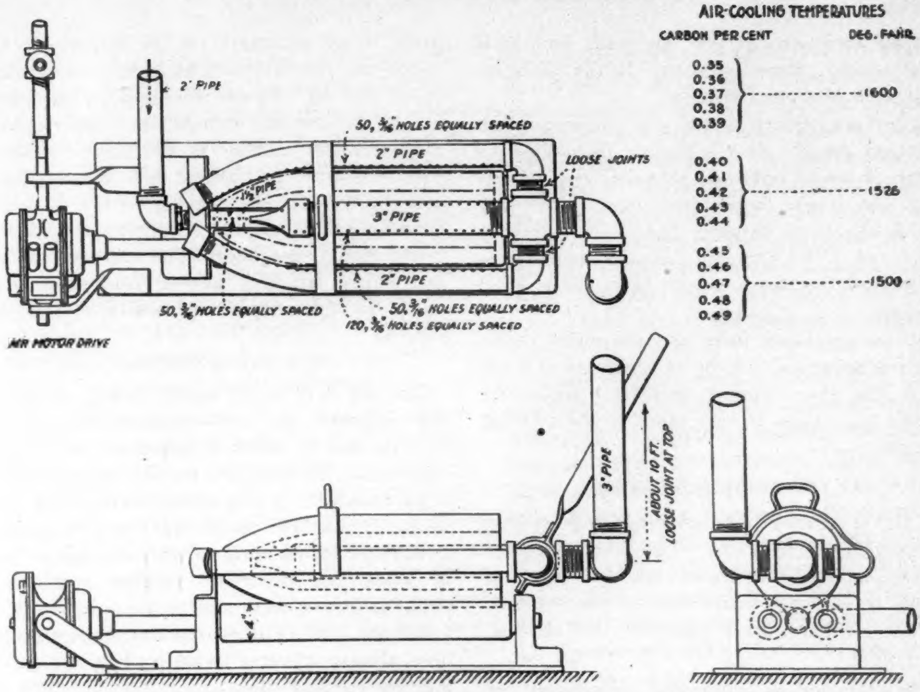
Naturally he approached the English-owned company first for support, and, after giving his word that the Allies would fully compensate the company, he enlisted the services of the chief engineers, Messrs. Thomas Masterson and J. T. Hayward, for the purpose of carrying out his plans. His difficulties were intensified by the action of the members of the Commission, who not only opposed his suggestions, but on several occasions arrested his volunteer assistants while his back was turned. Even when they eventually consented to his policy, unwillingly enough, the progress of the necessary work was so slow that he had to lead the operations personally. Iron scrap was dropped down the wells to render them unworkable; oil was let into the boilers and machinery and set on fire; sulphuric acid was poured into the plant to corrode it; and liberal use was made of sledge-hammers to break everything possible. As for the destruction of the stores of oil, some of the oil was allowed to escape from the tanks and was immediately set on fire. Within a minute the tanks, which then contained an explosive mixture of gas and air, began to explode with devastating violence. The wrecking party proceeded from one tank to another throughout the Moreni district, and destroyed over 40,000 tons of oil. The smoke from the conflagration formed a black cloud overhead which cut off the light of day, and the only illumination was that provided by the burning oil. The sparks from wooden structures set fire to the wells.

The party finally turned to the works of the Astra company, and, after firing the tanks and the shops, attempted to destroy the power-house. It was found, however, that this building was full of gas, and members of the party advised its abandonment. But Colonel Norton Griffiths was not to be beaten, and he entered the building himself with lighted straw to set fire to the oil that had been pumped into it. The space was full of gas with little or no air, so our intrepid pioneer suffered, not from an explosion, but from the effect of burns. Several days were spent in destroying wells and plant east of Moreni, and subsequently the Buzeu and Bacau fields were treated in like fashion, and here again only just in time.

COMPRESSED AIR COOLS SHELL FORGINGS

A method of air cooling 9.2-in. forgings for shells, indicated in the accompanying drawing, has been obtained from J. W. Dunphy, engineer, Canada Cement Co., Ltd., Montreal, Que., who generously contributes the information together with some comments on the performance of the apparatus. The decided success ascribed to it will make it of interest to manufacturers of shell steel.

For example: With steel having the following chemical analysis: Carbon, 0.42 per cent.; silicon, 0.063 per cent.; sulphur, 0.034; phosphorus, 0.025; manganese, 0.48, the physical results after proper heat treatment and cooling under ordinary atmospheric conditions gave a yield point of 40,300 lb. per sq. in., a tensile strength of 80,600 and an elongation of 27 per cent. The results with cooling with the apparatus shown gave a yield point

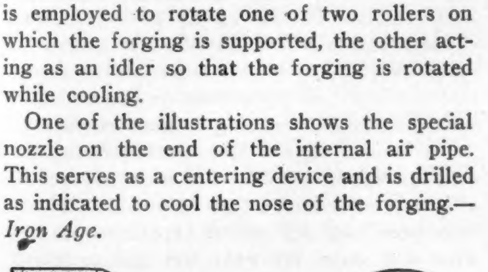


AIR-COOLING SHELL FORGINGS

of 49,300 lb.; a tensile strength of 94,000 lb. and an elongation of 25 per cent.

The air consumption is 2100 cu. ft. per min. and it takes approximately 5 min. to cool the forging from the temperature on coming from the furnace to 800 deg. Fahr. The air is supplied at 80 lb. per sq. in. The drawing indicates how the air pipes are lifted and swung away to remove the one and place in position the next forging. A compressed air motor is employed to rotate one of two rollers on which the forging is supported, the other acting as an idler so that the forging is rotated while cooling.

One of the illustrations shows the special nozzle on the end of the internal air pipe. This serves as a centering device and is drilled as indicated to cool the nose of the forging.—*Iron Age.*



COOLING AND CENTERING NOZZLE

PNEUMATIC TOOLS IN SHIPYARDS

BY GLENN B. HARRIS

Perhaps in no other branch of the metal industry have pneumatic tools proven of greater value than in the shipyards of the country engaged in the building of steel ships.

The chipping hammer has proven of incalculable benefit in all chipping operations, and of equal value in calking. In the latter operation it is, of course, used on all side and deck seams as well as on bulkheads and tanks, and its gain over hand work is probably three to one, while the character of the work performed by it is superior to that done by hand, inasmuch as the blow delivered by the pneumatic hammer, is always of uniform character, due to a practically constant air pressure, while it is said that the work of a man by hand is not so marked, owing probably to the fact that he is fresh and vigorous in the morning and wanes in strength as the day progresses. Calking done by machine, even when tested by high pressure, seldom shows a "sweat." In the boiler shops of shipyards the pneumatic tool is used also with the same advantage.

In chipping, the pneumatic hammer is used

for all operations of that character, and, as is well known, there are many of the tools required in ship construction.

They are utilized to cut and finish up patch bolts on the eye of a propeller, in making up patch plates on boss and propeller eye, in cutting out hawse holes, and other work for which the hand hammer has been ordinarily employed. The chipping hammer unquestionably does the work of at least three hand workers.

In an amplified form the pneumatic hammer has proven also to be of the greatest benefit to the ship building industry. Reference in this connection is here made to the riveting hammer.

THE RIVETING HAMMER

This is simply the chipping and calking hammer in enlarged size. The piston diameter is not materially increased, but the length of stroke is extended from that of the chipping hammer, which is about 2 or 3 in., to 6 in., 8 in. or 9 in.

The hammer as originally introduced for shipyard work was mounted in various devices for ship riveting. There was a special machine for driving flush deck rivets, which consisted of a heavy, cumbersome frame carrying a pneumatic hammer of extraordinary proportions. This machine did the deck riveting, and a man with a chipping hammer cut off the head, after which in some instances the rivet was driven further into place, although unnecessary, except, perhaps, for the purpose of smoothing down. This was an absolutely unnecessary proposition, as the ordinary pneumatic hand hammer would do the work with greater efficiency and in less time.

In the case of outside or shell riveting an apparatus was provided for holding the riveting hammer. This has since been dispensed with and the usual type of riveting hammer employed to take its place.

The riveting hammer has worked a revolution in the construction of steel ships, not only permitting their construction in a short period of time, but lessening materially the cost of production.

An ingenious device which is a modification of the pneumatic hammer is utilized for packing condenser tubes. A leaky condenser on board ship causes a great deal of trouble and it is claimed that the cause of leakage in a great many instances can be directly traced to the fact that the packing laces are not carefully laid in. Twelve to eighteen tube ends can be packed per minute, and experts have exceeded this number in the same length of time. As with the calking and chipping hammer the work of the packing tool is of a uniform character, and each tube is packed precisely like its neighbor. The machine is light and easily handled, and is undoubtedly of value for the purpose for which it was designed.

THE PNEUMATIC DRILL

The air drill is of equally great saving in the shipyard, as is the pneumatic hammer, and the uses to which it is put are varied and numerous. In addition to all drilling operations requisite in ship construction, this conveniently portable machine is used to greater advantage in reaming operations, for boring in wood and different grinding operations. What is known as a close corner drill is also marketed and is of particular use and has been almost universally adopted in shipbuilding for rolling the outer tier of flues in boilers; also for tapping and other work in close quarters. The pneumatic drill is also used to great advantage in drilling out rivets in the shells of ships. Various new uses are continually suggesting themselves for the employment of this tool, and they all make for economy in production.

PROPER HANDLING OF PNEUMATIC TOOLS

In most yards the workmen handling pneumatic tools are not mechanics, and the machines require careful handling to obtain the best results. This is hardly to be expected of unskilled labor. Like all other classes of machinery, these devices must receive proper lubrication to insure the best results, and this, with their proper cleaning, is most essential.

The writer, from a long experience in this line, knows full well that the material used in all these tools is the best obtainable. There have been long periods of experiment to get what will stand the wear and tear to which they are subjected. The moving parts in both the hammers and drills are accurately and closely fitted, and when proper lubrication is neglected these fine pieces of machinery wear rapidly and in a very short time refuse to work.

As the air which is taken into the compressor generally contains some particles of grit

and dust, the working parts of the hammer and drill are likely to become clogged with this foreign matter, causing the ports to become closed and the tools rendered inoperative. The use of a poor grade or heavy-bodied oil will also cause the same trouble. The best plan to follow in a case of this kind is to cleanse by introducing gasoline (petrol) in the air induction. This will dislodge any extraneous matter and cuts the thick oil, both of which can then be removed by blowing air through the hammer.

BLOW OUT PIPES AND HOSE

Another great source of trouble and annoyance is sometimes located in the pipe line. Moisture in the air will rust the pipes through which it is conveyed, and if the tools are connected up without first blowing out the pipes a sediment is likely to be blown through into the tool, causing valves or pistons to stick. Rubber deteriorates rapidly and dislodged particles may blow through into the tool and render it inoperative.

It frequently occurs that a workman will make complaint that his hammer or drill is not working properly, or that it will not run at all. In a great many of these cases, on the machine going to the tool room, it is found that sediment or pieces of rubber were at the bottom of all the trouble, and when cleaned with gasoline (petrol) and oiled they would work perfectly.

In a great many of the plants of this country a special tank is provided, in which the tools are immersed at night, then blown out in the morning and thoroughly oiled with the best grade of light machinery oil obtainable. This will not only greatly prolong the life of the tool, but much superior results will be obtained in all ways. It is also a wise plan to make use of a strainer at the induction end of the tool. It is remarkable what an accumulation of grit and dirt will be gathered in a short space of time under the usual conditions in a shipyard.

HARMFULNESS OF SHORT PISTONS

One of the most flagrant abuses to which the pneumatic riveting hammer is subjected is the use of short pistons. The riveting hammer was designed with all its parts properly proportioned to meet the requirements of various classes of work for which these tools are adapted. The workmen have discovered, however, that a piston reduced from the standard of 4 inches in length to 2½ inches delivers a more rapid blow and for a time performs faster work and with greater ease of holding. Short pistons, however, not having the body of metal in them, are subject to crumbling, due to the hard work to which they are subjected. The small, broken parts cut the cylinder, and if the latter is not damaged beyond repair from this cause it is only a question of a short time before the hammer is irreparably ruined.

When cylinders are cracked and handles and rivet sets broken the hammer should be examined to determine whether the workmen have in service a short piston. They have devious ways of obtaining them. The only sure way to determine whether a short piston has been substituted for the proper one is to have them examined while in service, as it has been found that the workmen carry the short pistons with them, make an exchange after taking the hammer out of the tool room and then replace the proper piston at the end of the day, when the tool is returned to its proper quarters.

Another abuse of pneumatic tools is the taking of them apart and the putting of them together again. Some repairmen, instead of using a wrench or soft hammer in loosening or tightening the handle of a riveting or chipping hammer, will employ a hard hammer, badly battering the parts and sometimes breaking them. The finished parts should never be struck with anything but a lead or copper hammer, and even when this is done care should be used not to unnecessarily strain the threads between the cylinder and handle.

It will pay any shipbuilding plant to employ a man who is competent to look after the penumatic tools and see that they are properly cleaned and lubricated. In cold weather it is a wise proposition to warm up the tool. This can be done at the rivet forge. With the blow of the piston in the riveting hammer on the set when the parts are cold breakage is likely to occur. In some yards with which the writer is acquainted it is a practice to offer a premium to the workman taking good care of his tool. This should result in a saving to users of pneumatic appliances of all kinds.—*Marine Engineering.*

GASIFYING CRUDE OIL FOR SPRAY BURNERS

BY W. A. JANSSEN*

The first spray nozzle for burning oil was developed in America. Since then there have been innumerable modifications of spray and jet burners. These may be divided into two classes, high pressure and low pressure types. Aside from the pressure of operation, they also vary in design and construction, depending upon the atomizing agent used. These burners are dependent for their success on the use of air or steam as an atomizing agent. In addition some burners also have incorporated in their construction some form of spiral for mechanical atomization.

The spray burner consists essentially of a fan-shaped spray of steam or compressed air upon which a stream of oil is allowed to trickle, the oil being diffused or atomized and burned. The jet burners, of which there are many types, are so constructed that a stream of oil is swept into and becomes a part of a stream of air of steam, being atomized therein and subsequently burned. The spray and jet types of burners have their limitations, because of their inability to maintain a positive adjustment of the definite amounts of oil and air necessary to assure and produce perfect combustion. This condition is further aggravated by the use of oils of variable specific gravity, which congeal in cold weather, making perfect combustion almost impossible without the almost constant attention of the furnace operator.

Because of the inability to properly control the air supply to definite combustion proportions, the quantity of air is usually in excess of theoretical requirements for complete combustion, causing a reduced flame temperature. In the spray and jet types of burners, it is essential that there be an abundance of air in order to assure complete atomization and avoid smoking. If the burners are adjusted so as to admit a theoretical amount of air, the oil is not thoroughly atomized, resulting in imperfect combustion, accompanied by excessive smoking and attendant reduction in flame and furnace temperature. The great objection to the present methods of oil burning is because the vaporization and combustion are practically simultaneous and that both occur within the combustion chamber.

NEW SYSTEM OF GASIFYING

During the past year there has been developed a system of oil burning wherein the oil, instead of being atomized or vaporized, is gasified in a specially designed vaporizer outside of the furnace. The gaseous product is forced into a combustion chamber under positive pressure, resulting in perfect combustion. This method of oil burning consists essentially of producing an oil-gas in a specially constructed vaporizer outside of the furnace proper, through the union of oil and heated air in definite proportions for perfect combustion. The air for combustion is delivered by a compressor at about 2-lb. pressure and a velocity of 150 ft. per sec. The air is forced to the vaporizer through cast-iron preheater boxes placed in the path of the outgoing waste gases. With the admixture of oil in the vaporizer, a gaseous product is formed which is delivered to the combustion chamber under continuous pressure.

The cast-iron preheater, Fig. 1, consists of a closed cast-iron box with openings to connecting boxes for the admission of incoming air. A series of vertical flues are provided to permit the passage of the outgoing waste gases through the apparatus, thus providing a source of heat for preheating the air for combustion. The number of preheaters required is dependent on the oil consumption for which the furnace is designed. They are stacked one over the other, and are so placed in the path of the outgoing gases that their walls will transmit the maximum amount of heat. Each heater is provided with an inlet and outlet opening for the admission of air. They are located on the opposite ends of the heater, necessitating a complete passage of air through the apparatus. As the heaters are stacked, the inlet opening of one connects with the outlet opening of another. With this arrangement the vertical flues are thrown out of line, thereby retarding the flow of the outgoing gases, permitting a greater heat absorption through the walls of the preheaters.

THE VAPORIZER

The vaporizer, Fig. 2, is a hollow cast-iron fitting. Its size is dependent on the calculated oil consumption. It has conveniently arranged inlet and outlet openings. Within the vapor-

*From a paper at the annual meeting of the American Foundrymen's Association, Boston, Sept. 27, 1917.

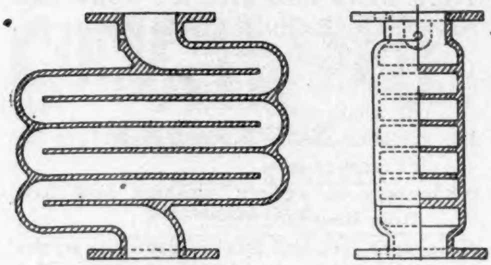


FIG. I

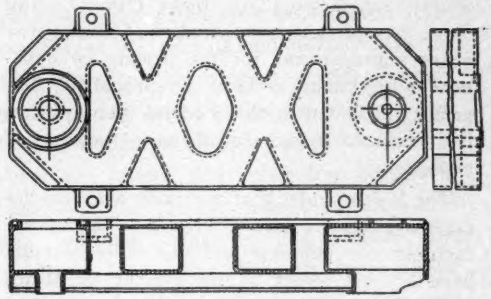


FIG. 2

izer are a series of baffles which form a winding zigzag path for the gaseous mixture of air and oil. The long winding passage is essential for complete gasification. The preheated air enters the inlet of the vaporizer and commingles with the oil stream. On striking the first baffle, gasification is begun. The mixture of air and oil gas then winds past the succeeding baffles. It finally is discharged from the vaporizer through a pipe in the furnace wall leading to the combustion chamber.

If perfect combustion is to be attained, the proportions of oil and air must be right and the temperature of the preheated air also must be correct. The installation operates most efficiently when the temperature of the air is about 800 deg. Fahr. Allowing a temperature drop of about 100 deg. for radiation and the conversion of oil to gas, the net temperature of the gaseous mixture is about 700 deg. Fahr. The velocity of the gaseous mixture should be about 150 ft. per sec. in order to prevent back-firing or flame propagation in the direction of the source. This is most essential, as the temperature of ignition, 1,050 deg. Fahr., is only a few hundred degrees higher than the temperature of the gaseous mixture, which in the proximity of the heated combustion chamber almost instantly is brought to ignition temperature.

The heavy fuel oils of commerce are practically all of the following composition: Carbon, 84.9 per cent.; hydrogen, 13.7 per cent., and oxygen, 1.4 per cent. The Baume gravity is 26 deg. and the oil weighs 7.4 lb. per gallon. For perfect combustion this necessitates about 3.4 lb. of oxygen or 14.5 lb. of air per pound of oil. This is equivalent to 180 ft. of free air per pound of oil, or about 1,500 cu. ft. of free air per gallon. This may be more easily expressed as 25 cu. ft. per minute per gallon per hour.

WAR STATUS OF EXPLOSIVES

Any person in the United States found with explosives in his possession after November 15, and who does not have a license issued by the Federal government showing the purpose for which the explosives are to be used, will be at once arrested and fined up to $5,000 or sent to prison for one year. If the circumstances warrant, the person may be fined $5,000 and in addition given the one year in prison.

This is the principal clause in a war measure passed by the last Congress and which is now being put into effect by the Bureau of Mines, Department of the Interior, which bureau has been charged with its enforcement. Francis S. Peabody, of Chicago, a well known coal operator familiar with the use of explosives, has been appointed by Secretary of the Interior Lane to act as assistant to the Director of the Bureau of Mines, Van H. Manning, in the enforcement of the law. Under the law, the Director of the bureau is empowered to utilize the services of all United States officers and all police officers of the states. The police of the cities have already been organized for this work, headed by a committee of chiefs of police in the big cities, of which Major R. W. Pullman, superintendent of police of Washington, D. C., is chairman. The police are not only to look after the enforcement of the law, but are also to make thorough investigations of all dynamite outrages and fires in factories and warehouses, and to make their reports to the Director of the Bureau of Mines.

Persons apprehended in plots to blow up factories and bridges will be turned over to the authorities for prosecution under Federal or state laws. Most states have specially

severe punishments for these crimes. New York has an extreme penalty of twenty-five years imprisonment for the placing of dynamite with intent to blow up property. The penalty provided in this Federal war measure is merely to cover the illegal possession of explosives.

The law provides that everyone who handles explosives must have a license. The manufacturer, the importer and the exporter must have licenses issued by the Bureau of Mines in Washington. The seller of explosives and the purchaser of explosives must also have licenses, these to be issued generally by county clerks, or other local officers who are authorized to administer oaths. There will be at least one licensing officer in each county, and more agents will be designated if the county is sufficiently large to warrant it. If a state has laws providing for a system of licensing persons manufacturing, storing, selling or using explosives, the state officials authorized to issue such state licenses shall be designated as federal licensing agents; also city officials qualified to issue city explosives licenses will be given authority to issue federal licenses. A federal license will not relieves any person from securing licenses required under state laws and local ordinances.

In each state there will be appointed a state explosives inspector, who will represent the Bureau of Mines in the administration of the law within the state.

Only citizens of the United States or of countries friendly to the United States and the Allies may so obtain licenses.

Contractors, mining companies, quarrymen and others using large quantities of explosives, which are handled by employees, may issue explosives to their employees only through those employees holding a license, called a foreman's license.

The purchaser of dynamite, in obtaining a license, must state definitely what the explosive is to be used for and will be held accountable for its use as stated and the return of any explosives that may be left.

With the strict enforcement of this law, the Federal authorities hope to prevent explosives falling into the hands of evilly-disposed persons and to put a stop to all further dynamite plots.

YOUR DEAR LAD AND MY DEAR LAD

Down toward the deep blue water, marching to the throb of drum,
From city street and country lane the lines of khaki come;
The rumbling guns, the sturdy tread, are full of grim appeal,
While rays of western sunshine flash back from burnished steel;
With eager eyes and cheeks aflame the serried ranks advance;
And your dear lad, and my dear lad, are on their way to France.

A sob clings choking in the throat, as rank on rank sweeps by,
Between those cheering multitudes, to where the great ships lie;
The batteries halt, the columns wheel, to clear-toned bugle call,
With shoulders squared and faces front they stand a khaki wall.
Tears shine on every watcher's cheeks, love speaks in every glance;
For your dear lad, and my dear lad, are on their way to France.

Before them, through a mist of years, in soldier buff or blue,
Brave comrades from a thousand fields watch now in proud review;
The same old Flag, the same old Faith—the Freedom of the World—
Spells Duty in those flapping folds above long ranks unfurled.
Strong are the hearts which bear along Democracy's advance,
As your dear lad, and my dear lad, go on their way to France.

The word rings outs; a million feet tramp forward on the road,
Along that path of sacrifice o'er which their fathers strode,
With eager eyes and cheeks aflame, with cheers on smiling lips,
These fighting men of '17 move onward to their ships.
Nor even love may hold them back, or halt that stern advance,
As your dear lad, and my dear lad, go on their way to France.

—Randall Parrish, in Chicago Tribune.

COMPRESSED AIR MAGAZINE

EVERYTHING PNEUMATIC

Established 1896

W. L. SAUNDERS, - - - Editor
FRANK RICHARDS, - Managing Editor
CHAS. A. HIRSCHBERG, - Business Manager
W. C. LAROS, - - Circulation Manager

PUBLISHED MONTHLY BY THE

Compressed Air Magazine Company
Easton, Pa.

New York Office—11 Broadway.
London Office—165 Queen Victoria Street.

Subscription, including postage, United States and Mexico, $1.00 a year. Canada and abroad, $1.50 a year. Single copies, 10 cents.
Those who fail to receive papers promptly will please notify us at once.
Advertising rates furnished on application.

We invite correspondence from engineers, contractors, inventors and others interested in compressed air.

Entered as second-class matter at the Easton, Pa., Post Office.

Vol. XXII. DECEMBER, 1917. No. 12

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We have been given the opportunity to serve mankind as we once served ourselves in the great day of our Declaration of Independence, by taking up arms against a tyranny that threatened to master and debase men everywhere and joining with other free peoples in demanding for all the nations of the world what we then demanded and obtained for ourselves. In this day of the revelation of our duty not only to defend our own rights as a nation but to defend also the rights of free men throughout the world, there has been vouchsafed us in full and inspiring measure the resolution and spirit of united action. We have been brought to one mind and purpose. A new vigor of common counsel and common action has been revealed in us. We should especially thank God that in such circumstances, in the midst of the greatest enterprise the spirits of men have ever entered upon, we have, if we but observe a reasonable and practicable economy, abundance with which to supply the needs of those associated with us as well as our own. A new light shines about us. The great duties of a new day awaken a new and greater national spirit in us. We shall never again be divided or wonder what stuff we are made of.—*WOODROW WILSON.*

JOHN D. CRIMMINS

John D. Crimmins died at his home in New York City Nov. 9, not far from the location where he was born nearly seventy-four years ago. All his life he was supereminently a New Yorker, our space limits prohibiting any attempt even to enumerate his specific activities. He was one of the great builders of the modern metropolis. He was the first contractor to employ commercially the rock drill in a large way in other than tunnel work. He planned and completed for the city large and difficult poritons of the "New" Croton Aqueduct, made the excavations for the gas tanks of many companies, built a large part of the first elevated railway, laid the Broadway cable road, built many large hospitals, churches, schools and business structures. At times he

had in his direct employ over 12,000 men and many more indirectly in sub-contracts.

John D. Crimmins was a many sided man, largely helpful in all the human activities of the city, political, religious, educational, reformative and beneficent. He was an ardent lover of everything beautiful in nature and art, and possessed a large collection of artistic and literary treasures. His success was well won, and all may be thankful that it was so.

EUGENE FRANZ ROEBER

The death of Doctor Roeber, the upbuilder and the one editor from the beginning of the admirable *Metallurgical and Chemical Engineering,* is a loss of unusual magnitude, not only to the publication of which he had made a stable success, but to the technical and scientific world and to the circle who had personally learned to love him as a true and ever helpful friend and to appreciate and admire him as a man. Just fifty years of age, perfectly equipped for his life work and in the full maturity of his powers, a score of years of productive usefulness might have been expected of him, but this was not to be realized. We know that our readers will appreciate and will thank us for the reproduction of the following heart-felt tribute of loyal appreciation from the editorial page of the journal which had so largely and so long embodied his personality.

A quiet funeral in a little house in East Orange, the body of its gentle master at rest among flowers in the parlor, the conventional service of death and the benediction—and the leaf of the big book was turned. Just a few words in ecclesiastical monotone—and everything so different. The machinery mumbles on, the presses revolve, the paper is whisked back and forth in the manner appointed, everything proceeds as before, but somehow the heart of it is still, and all the rest of us, major and minor parts of the organization, are benumbed for the time. We are catching our breath for a fresh start. Of course, the paper will continue; it will look the same and serve the same purpose, because it was planned unto whatever merit it has by one who had a great gift for this very thing.

Now let us consider what manner of man this was, who infused so strong a personality into his editorial work that the paper was almost as frequently spoken of as "Roeber's Journal" as by its printed title. Although he occupied posts of distinction, had been president of the American Electrochemical Society, of which he was one of the founders, and associated with many men of high repute on important committees, his acquaintance among men was far slighter than his influence over them. This was in part because his influence was widespread and in part because of his unusual modesty and extraordinary sensitiveness, which he had in greater measure than was compatible with comfort.

He was a little, round man with a round chin, round spectacles and a big round hat designed for a Texas sombrero, but which on his head straightway became *ein Professorenhut.* He was German born—anybody could see that—but he was the kind that those of us who knew Germany best before the war still love despite everything. And he was a thoroughly sound, patriotic, loyal American citizen without any reservation. He believed in everybody, had faith in everybody and a good word for everybody. There was such kindliness and goodwill in his greeting, in his unflinching, believing, encouraging look that the very thought that those gentle blue eyes are dimmed for all time bites into the heart.

The man on the street or in the railway car did not know these things, and so sometimes he was taken for an enemy alien—our editor —whose father and grandfather had opposed Prussianism all their lives and who himself had left Germany because of it. But the slightest unfriendly glance, or the tone of a word spoken in scorn were enough to give him acute pain. Rarely have we known a mortal with such hair-trigger sensitiveness. Nevertheless, he would not let it hinder him from digging into the day's work or from bearing the sting of it in silence. We verily believe that this shortened his life.

In his office, at his desk, he was a different man. There command was easy to him and there was no hesitation in his decisions. When well-wishers urged him to avoid printing articles with mathematical developments beyond the reach of most readers, he would smile, shake his head—and print in full. If a fair word about labor might offend someone who had neglected to provide for the life, liberty and pursuit of happiness of employees, he would chuckle—and print it. Neither conventional ethics nor philosophy frightened him. He edited a technical paper, but he never forgot the human factor in applied science

and industry. When he felt that something needed to be said, he had no interest in minor consequences. He had confidence in his own wisdom, and Wisdom herself was justified in him. He was gracious in receiving advice, but independent in his conclusions. To think or to decide—and decide aright—was neither hard nor painful to him. He was a master at his profession and he breathed the breath of life into his work.

In taking up the burden that has fallen from his shoulders, the editors and publishers are not concerned about articles, or their arrangement, or about comment on things of interest, or advertisements, for these are all provided for. The burden of our hope is that we may attain the same at-homeness in the work and the same cordial goodwill of our readers that the late Dr. Roeber both won and enjoyed. Peace to his memory.

NEW BOOKS

The Commonwealth of Pennsylvania, by Thomas Kilby Smith. The Encyclopedia Press, Inc., New York. 328 pages, 5 by 7½ in., 6 full page half tones and map, $1.00.

This is the first of a projected series of hand-books of the different States of the Union. It is a concise history and much more than that, not only relating the story of the events but setting forth the conditions, institutions and agencies which make the background and furnish the environment for their presentation. The various things for which the State has been notable and the lofty status of the Commonwealth today are ably presented.

The Principles of Iron Founding, by Richard Moldenke, E. M., Ph. D., McGraw-Hill Book Company, New York, 527 pages, 6 by 9 inches, 45 cuts in the text, $4.00 net.

This book, by the Nestor of American foundrymen, must at once take its place as a standard work, a position which it may be expected to deservedly hold for long years to come. The field of iron founding, in its largest sense, is completely covered. As it says: "it goes into the elements of iron making, with its allied industries, with the object of drawing conclusions therefor of value to the foundryman in his daily work." It has nothing whatever to do with the details of the molder's art. It is a rather curious thing that while the use of iron can be traced back some four thousand years, cast-iron is quite a modern product, and what this work calls "the modern foundry advance practically all fell within the last twenty years of the nineteenth century," so that the present book could not well have been prepared at any earlier date.

THE EXPLOSIVES LAW

For the administration of the Explosives Law, approved October 6, the Bureau of Mines is appointing licensing agents in all parts of the country, and is sending to them the necessary application blanks, license forms, etc., and publicity matter which will appear in local papers, outlining the procedure necessary to secure licenses.

As fast as licensors are designated and notice given in this way to the public, licenses will be issued in all localities. Meanwhile "business as usual" is urged, to the end that there may be no interruption in production of coal or other necessities involving the use of explosives.

On and after November 15, all manufacturers, vendors, foremen, exporters, importers, and analysts who deal with explosives or ingredients of explosives shall keep an itemized record of sales, issues, or other disposition made of explosives and ingredients, pending receipt of detailed instructions and the securing of necessary licenses required by law.

THE LIBERTY MOTOR FROM DIFFERENT VIEWPOINTS

One of the first problems which confronted the War Department and the Aircraft Production Board after the declaration of hostilities was to produce quickly a dependable aviation motor. Two courses were open. One was to encourage manufacturers to develop their own types; the other to bring the best of all types together and develop them. The necessity for speed and quantity production resulted in the choice of the latter course. By the inspiring co-operation of consulting engineers and motor manufacturers, who gave up trade secrets under the emergency of war needs, a new motor, designated by the Signal Service as the "liberty motor," has been developed for the use of the United States air service, and is the country's main reliance for the rapid production of this important component of high-powered battle planes.

In power, speed, service, ability, and min-

imum weight the new engine invites comparison with the best the European war has produced. One of the chief rules adopted at the beginning of the designing work was that no engineer should be permitted to introduce construction which had not been tried out: there was no time for theorizing. The new engine is successful because it embodies the best thought of engineering experience to date. Not only did consulting engineers of this country furnish ideas, but representatives in the United States of England, France, and Italy contributed to the development of this motor.

While it is not deemed expedient to set forth in detail the satisfactory performances and the mechanics of the new motor, it may be said that standardization is a chief factor in the development of the Government's motor. Cylinders, pistons, and every other part have been standardized. They may be produced rapidly and economically by a great many factories operating under Government contracts, and may be rapidly assembled, either by these plants or at a central assembly plant. It should be understood that the "new" motor is not, strictly speaking, an invention. No doubt it has what are in effect new values, but the real result achieved is the combination of the strong points of all the available contrivances of the kind.—*Aerial Age.*

In a recent number of the *Official Bulletin* of the United States, the story of America's effort to develop in a few days an aeroplane engine which would "lick creation," is told with a journalistic touch that is quite unofficial. Those who are interested, and who is not, may read it on another page of this issue. They will observe that American engineering pride had been stung to the quick by the statements freely circulated a few months ago, that if the United States were to be in a position to produce the huge fleet of aeroplanes, for the construction of which one hundred and twenty million pounds had been voted, they would have to adopt European models. Rather than submit to such a slight upon its skill, America resolved to set about the design of an engine in record time——before ever the models could cross the Atlantic. This was something after the American heart—a real "stunt." The authorities, equivalent to our Air Board, "figuratively locked" two designers in a suite of rooms in a Washington hotel for five days. Consulting engineers and draughtsmen from various sections of the country came to help them, the drawings of all aero-engines that had ever been were collected around them, and every manufacturer in the country threw his knowledge and experience at their feet. It must all have been a bit embarrassing, but our cousins work best under a degree of bustle that would upset us at home. The great work began on June 3rd, and exactly one calendar month later the new engine was set up. But to complete the "stunt," it had to be run in the "nation's capital" on Independence Day, and four young men transported it in a special express car from the Western city where it was built to Washington. Thirty days later, the Government felt justified in accepting the engine as "the best produced in any country," and American engineering pride was re-established. We do not do things in quite such a dramatic way in the old country, we like less limelight, but we are not the less ready to admit the greatness of the achievement. The engine is, no doubt, a composite of all types, but it is perfectly standardised, and manufacturers are already busy turning out the parts by the thousand. We may opine that it is very American, as American as Ford or Overland cars, and that it is made in a way that would rather shock our engineering susceptibilities. British and French machines, says the *Official Bulletin,* are "not adapted to American manufacturing methods. . . . It would require a year or more to teach American manufacturers and their mechanics to turn out such high-specialised aeroplanes." That gives a clue to the type, and makes us impatient to see an engine which, whatever its lack of qualities on which, here, we set our hearts, is an economical proposition, because it is "good enough" and not "too good," as so many of our munitions of war are. The real measure of excellence is successful operation —nothing else matters when one is in a hurry. —*The Engineer, London.*

NOTES

An empty 12-in. cast iron water main 760 ft. long was nearly buoyant enough to float when the ends were tightly closed, and was easily handled in the Monongahela River, at McKeesport, Pa. The sections were continuously jointed together on shore, launched, and supported at intervals of 100 to 150 ft. by sus-

pension from barges, until the whole line was completed, towed to position and lowered to the dredged trench. The whole operation including the dredging of the trench was accomplished by 15 or 20 men in 15 days.

There might be serious objection on the part of a food commissioner and on the part of temperance people in the exportation of millions of gallons of molasses from Porto Rico to Martinique to be used in the manufacture of rum, but this rum is being sent to France to be used against the Germans, for it appears in No Man's Land as high explosive.

A large Louisiana fishing company has cut down its fuel bill more than $300 a month by installing in an oyster boat a gas-producer plant which transforms coal into power gas. This gas is being burned in an explosive engine instead of gasoline.

Driving a Diesel engine with gas made from peat is one of the developments of the coal and oil shortage in Denmark, says *Commerce Reports*. A large engine shop in Copenhagen announces this new adaptation.

The Liberty Loan Oil Co. has been incorporated under the Colorado laws with a capitalization of $250,000 divided into five million shares of a par-value of five cents.

American railroads have achieved the feat of adding to their freight service, in the short space of two years, an amount equal to the total traffic of Great Britain, France, Russia, Germany, and Austria combined.

Consumption of black blasting powder in the United States in 1916 amounted to over 8,600,000 kegs of 25 lb. each. Of this amount, metal and coal mining consumed 7,392,000 kegs, the remainder being used in other operations.

One of the innovations adaptable to the use of sand belts, is the pneumatic pulley to be used in place of the padded wheel. This pulley is inflated in much the same manner as a bicycle tire, and its convenience and practicability lie in the fact that it can be inflated very hard, to offer a small surface of the belt to the work, or if desired to adapt it to a flatter surface, less air pressure is given.

The Louisiana sugar industry will have $5,000,000 worth of blackstrap molasses this year as residue from sugar making. Formerly such molasses was distilled into whiskey, but this year it will be turned into commercial alcohol for munition purposes, and also sold for mixing in cattle feed.

What is probably the world's highest velocity rope drive, according to J. Melville Alison, is in operation in Cleveland, Ohio, where 19 two-inch ropes travel 7,800 ft. (1.47 miles) per min. over a driving sheave 14 ft. 4 in. diameter to a driven sheave 4 ft. 7 in., only 27½ rope-diameters, transmitting about 1,400 hp.

New drill steel used during 1916 by the Old Dominion Copper Mining and Smelting Co., Gloebe, Ariz., according to the "Old Dominion Bulletin" consisted of 1.5 tons Bull Moose, 8 tons stoper, 2.5 tons plugger and 3.5 tons Leyner. One man sharpens and one man tempers all steel, averaging 455 pieces per day each during 1916.

The British government has decided that the construction of the proposed tunnel under the British channel is not to be proceeded with until after the war. The tunnel could not be completed so as to be of any particular assistance during the war. Had such a tunnel been ready at the beginning of the war, however, it might have been of considerable value.

As a general rule, it may be stated that in case of a mine explosion when men are working underground, arbitrary reversing of the air current in a mine ventilated by an exhaust fan is not wise, especially when the main traveling roads are on the intake current. Many men have lost their lives through air reversal when they were on their way out of the mine after an accident.

The power from a gallon of gasoline is generally rated in these days by the distance it will propel an automobile. But the same energy, if directed to other and more varied purposes, will milk three hundred cows, bale four tons of hay, mix thirty-five cubic yards of cement, plow three-fifths of an acre of ground, or it will generate enough electricity to light a large farmhouse for thirty hours."

Advocates of all-welded piping systems will be pleased to know that a brewery having a very extensive suction-gas (ammonia) piping system, has just completed remodeling the system, welding the whole to do away with joints. Oxyacetylene was the process used. The progress in this field generally is indicative that the days of flanged headers, receivers, manifolds, etc., as well as piping systems with numerous flanged joints, are soon to pass away.

According to statements made by merchant captains arriving at ports in the United States the periscopes of German submarines are now being nickel plated or bronzed with aluminum in order to make them invisible. This process, it is claimed, reflects the colors of the surrounding water and leaves the periscope indistinguishable from the water. The officers said the fact that so many steamships of late have been sunk without anyone aboard having seen any sign of a submarine is proof of the truth that the U-boat periscopes have been rendered "invisible."

The production of stainless steel cutlery is one of Sheffield's great achievements of the last year or two. At the present time its manufacture is greatly restricted or entirely suspended owing to the war requirements in connection with chrome steel. The steel is the invention of Mr. Harry Brearley, and it contains 12 to 14% of chromium and 0·25 to 0·35% carbon. Unlike many types of stainless metal knives, it gives an excellent cutting edge. Knives in constant use at the table for months withstand the ravages of even mustard pickles, the most corrosive of foods or condiments. They remain perfectly bright, and require nothing but a damp cloth for cleaning.

An irrigation project that will supply 50,000,000 gal. of water daily is now under construction on the island of Maui, Hawaiian Islands, by the Pioneer Plantation. The main part of the project is a tunnel 1½ miles long, cutting across five ridges and replacing several miles of metal flume. The water is also to be used for the development of electric power. The project includes the replacement of 1½ miles of metal flume by a concrete-lined ditch, and the construction of concrete bridges over the main ditches in place of wooden structures.

A training school for women oxy-acetylene welders has been established at Notting Hill Gate in England, the expenses in connection with which are paid by the British Government. About two hundred skilled women welders have been trained in this school and at least twenty women are constantly in training. The trained women are successfully carrying out welding work in airplane factories, and the demand for them is so great that so far all the welders have been engaged by the various factories two or three weeks ahead of the completion of their course of instruction.

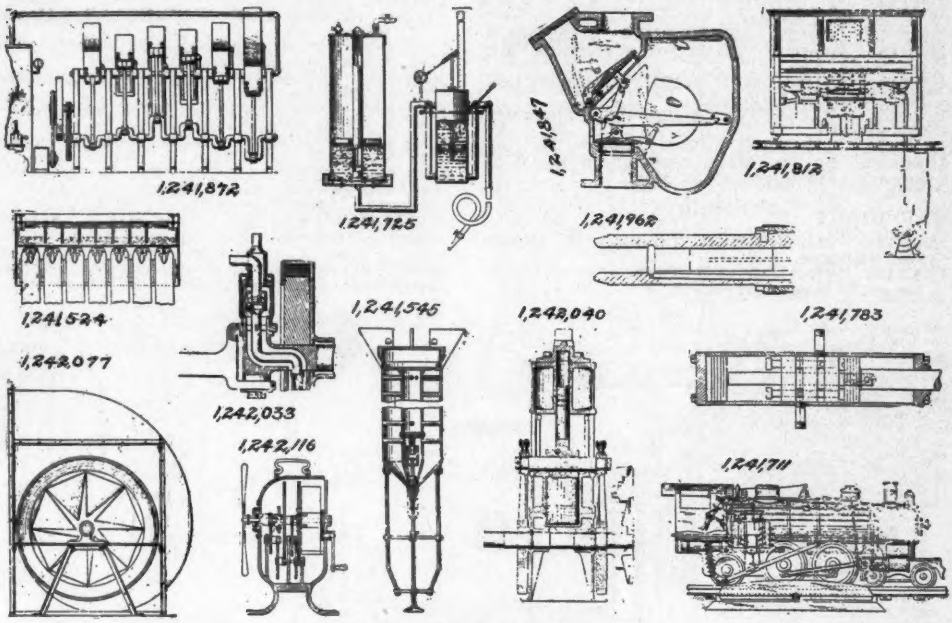
New York City's garbage, by treatment in a $3,000,000 recovery plant of the latest type on Staten Island, yields the following commercial products: Grease for 70,000,000 cakes of soap; 1,500 tons of nitrogen; 2,000 tons of phosphoric acid; 500 tons of potash. With the nitrogen, and the glycerin from soap making, there is a recovery of material yielding 3,500,000 pounds of high explosives, while the phosphoric acid and potash, as well as the nitrogen, are valuable in the making of commercial fertilizers. This plant operating under the so-called Cobwell process, which treats garbage almost entirely by chemical methods, has effected increased recoveries of valuable products amounting to at least 25 per cent. more than recoveries under the best previous reduction methods used for New York's garbage. In soap, for instance, there is an additional recovery of grease for 10,000,000 cakes a year, and in high explosives material for 700,000 pounds.

LATEST U. S. PATENTS

Full specifications and drawings of any patent may be obtained by sending five cents (not stamps) to the Commissioner of Patents, Washington, D. C.

OCTOBER 2.

1,241,524. HUMIDIFYING DEVICE. Victor A. Larson, Chicago, Ill.
1,241,545. AERIAL TORPEDO. Frank H. Patton, Flagstaff, Ariz.
1,241,581-2. FLUID-PRESSURE BRAKE APPARATUS. Walter V. Turner, Edgewood, Pa.
1,241-711. MOVEMENT-CONTROLLING MECHANISM FOR POWER-DRIVEN VEHICLES. James Culton, Denver, Colo.



PNEUMATIC PATENTS OCTOBER 2

1,241,725. GREASE-GUN. Howard E. Emigh, Santa Cruz, Cal.

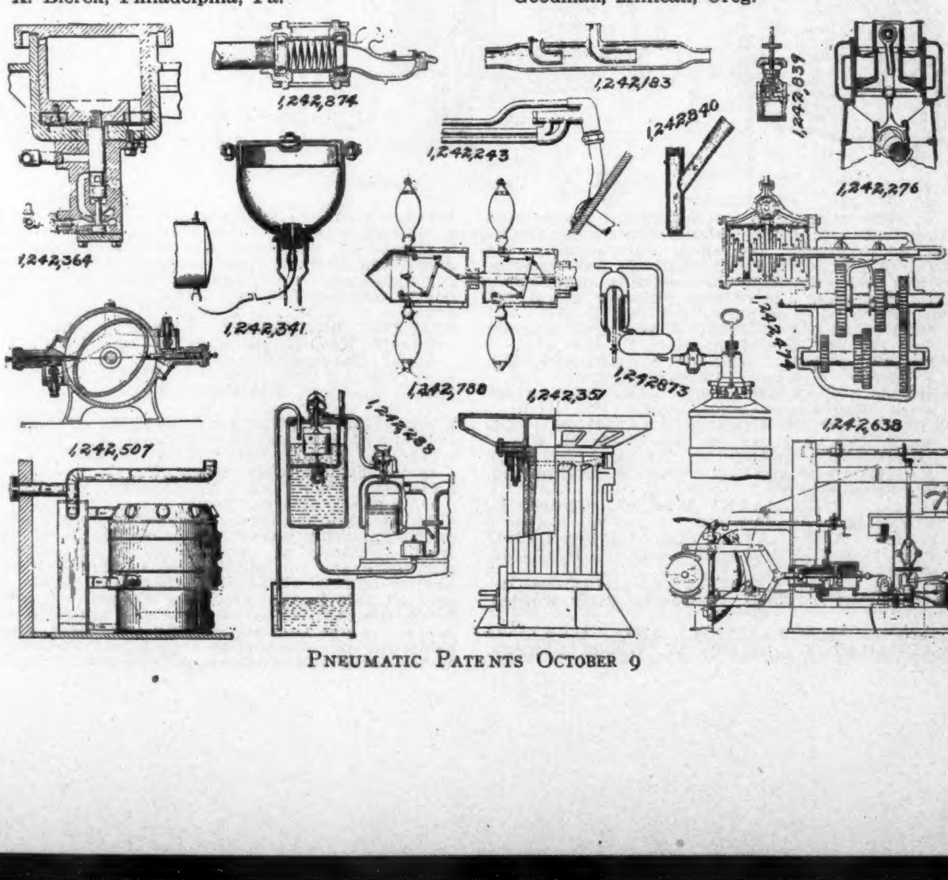
1,241,783. COMPRESSED - AIR VIBRATOR. Charles W. Tocknell, Kenilworth, N. J.

1,241,812. PNEUMATIC CONTROLLER FOR MECHANICAL PIANO-PLAYERS. Harold A. Bierck, Philadelphia, Pa.

1,241,847. DRY VALVE FOR AUTOMATIC SPRINKLER SYSTEMS. John R. Hamilton, Yonkers, N. Y.

1,241,872. AIR-PUMP. Anthony Z. Miciulis, Chicago, Ill.

1,241,959. FOLDING AIR - PUMP. Bennie Goodman, Millican, Oreg.



PNEUMATIC PATENTS OCTOBER 9

1,241,962. FLUID-OPERATED TOOL. Louis W. Greve, Cleveland, Ohio.
1,242,033. FLUID - PRESSURE TRANSMISSION. Albert E. Painter and Waterfield Painter, Reno, Nev.
1,242,040. AIR-COMPRESSOR. William Reaveli, Ipswich, England.
1,242,077. BLOWER. Adolph A. Thommen, Chicago, Ill.
1,242,116. AIR-FAN. John Andrew Sweney, Albuquerque, N. Mex., assignor to Lydia B. Sweney, Albuquerque, N. Mex.

OCTOBER 9.

1,242,183. OIL-BURNER. William G. Hamilton, Cleburne, Tex.
1,242,243. PROCESS OF CUTTING METAL. James R. Rose, Edgeworth, Pa.

1. The process of cutting metal projections from bodies or plates which consists in directing an oxidizing jet along substantially the plane of junction between the body and the projection and preventing the oxidizing action from extending from the cutting plane in the direction of the body or plate.
1,242,276. COMPRESSOR. William Everett Ver Planck, Erie, Pa.
1,242,287. FUEL - FEEDING APPARATUS. Frederick Weinberg, Detroit, Mich .
1,242,288. VACUUM-FEED SYSTEM. Frederick Weinberg, Detroit, Mich.
1,242,351. JOLT RAMMING-MACHINE. Edward Melville Huggins, New York, N. Y.
1,242,364. COMBINED SQUEEZE AND JOLT RAMMING MACHINE. Thomas J. Mumford, 2d, Plainfield, N. J.
1,242,431. PNEUMATIC SPRING. Ernest D. Foster, Los Angeles, Cal.
1,242,445. APPARATUS FOR TREATING LIQUIDS WITH GASES. Martin H. Ittner, Jersey City, N. J.
1,242,474. PNEUMATIC TRANSMISSION-OPERATING DEVICE. George M. Riley, Aurora, Ill.
1,242,507. VENTLIATING AND HEATING APPARATUS. Erastus W. Woods, Chicago, Ill.

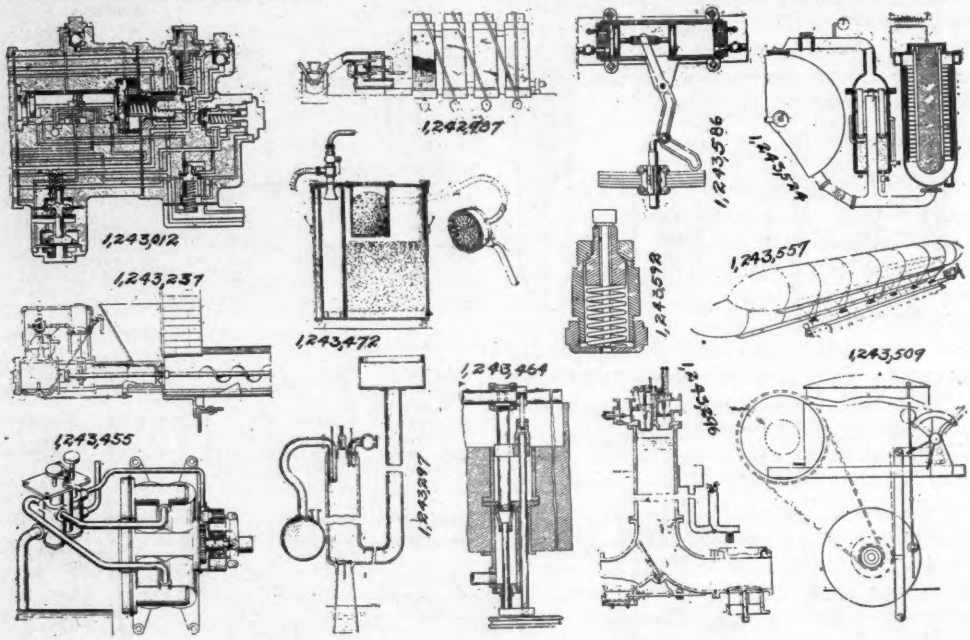
1,242,638. AUTOMATIC TENSION DEVICE AND BRAKE FOR WEB-ROLLS. Howard M. Barber, Stonington, Conn.
1,242,692. ROTARY AIR-COMPRESSOR. Philip D. Hibner, Seattle, Wash.
1,242,788. AIR-PROPELLER. Tony Francisco, South Cle Elum, Wash.
1,242,839. AUXILIARY AIR-VALVE. John J. B. Mulderig, Wilkes-Barre, Pa.
1,242,840. VACUUM BEAN-PICKER. Colton D. Naramor, Caro, Mich.
1,242,870. PNEUMATIC TOY. William Walter Rutter, Edmonton, Alberta, Canada.
1,242,873. PROCESS AND APPARATUS FOR FILLING VESSELS WITH MILK. Wilhelm Gotthilf Schroder, Lubeck, Germany.

1. A process of making durable milk characterized by the fact that the milk, after being pasteurized or homogenized is then passed through a surface cooler within a chamber under a vacuum until the vapor developing in the milk is sucked off, whereupon the milk still being under action of the vacuum is guided into a chamber also under a vacuum, and from said chamber is allowed to flow into the vessel of conveyance or milk can, in which it is closed tight.
1,242,874. TRAIN-PIPE HOSE. James S. Sheafe, New Brighton, N. Y., and Victor Tobolla, Chicago, Ill.

OCTOBER 16.

1,242,987-8. PROCESS OF OXIDIZING GASES. Frank C. Schmitz, New York, N. Y.
1,243,012. FLUID-PRESSURE BRAKE. Walter V. Turner, Wilkinsburg, Pa.
1,243,093. FLOATATION APPARATUS. Henry O. Norvell, Mascot, Tenn.

1. In combination, an elongated tank having agitator, having a discharging portion depending froth overflows at opposite ends, an aerating slightly below the liquid level in the tank and having outlets adapted to discharge strata of aerated pulp in the directions of the froth overflows, the tank being substantially unobstructed below the agitator and having a settling space below the same extending throughout the length of the tank, substantially as described.



PNEUMATIC PATENTS OCTOBER 16

1,243,237. CONTROLLING - VALVE MECHANISM FOR FURNACE-STOKERS. George W. Wood, Camden, N. J.

1. The combination with a plurality of stokers, each having independently operative fuel actuating means, of a valve casing having a plurality of distributing passages therein respectively connected to said actuating means, a valve having a port successively movable into register with said passages, means for supplying pressure fluid to said valve and to successively enter said passages through the port when the valve is actuated, and means for actuating said valve, substantially as described.

1,243,296. UTILIZING AN EXPANSIVE FORCE. Herbert Alfred Humphrey, Westminster, London, England.

1,243,297. METHOD OF RAISING AND FORCING LIQUIDS. Herbert Alfred Humphrey, Westminster, London, England.

1,243,455. STARTING MECHANISM FOR INTERNAL-COMBUSTION ENGINES. Gregory John Spohrer, East Orange, N. J.

above the other with the uppermost chamber adapted to contain a fire extinguishing fluid and the lowermost chamber adapted to contain air under pressure, the tank formed between its ends with an external indentation, a discharge tube for the fluid chamber open to the lower portion of the latter, an air inlet for the air chamber, and a valved tube bridging the indentation and extending from the air chamber to the upper portion of the fluid chamber.

1,243,770. PNEUMATIC TOOL. Mather W. Sherwood, Franklin, Pa.

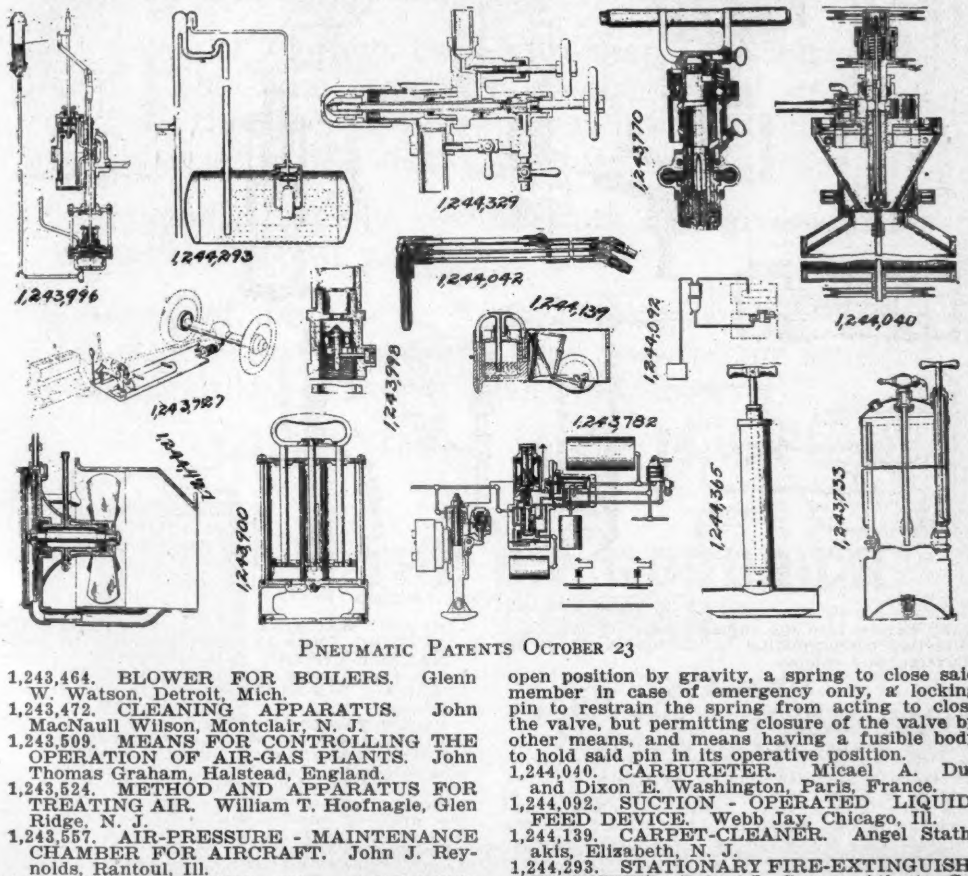
1,243,782. AUTOMATIC TRAIN CONTROL. Walter V. Turner, Wilkinsburg, Pa.

1,243,900. APPARATUS FOR PRODUCING ARTIFICIAL RESPIRATION. Edmund J. Tyler, Chicago, Ill.

1,243,996. FLUID-PRESSURE REGULATOR. Carl J. Smith, Indiana Harbor, Ind.

1,243,998. FLUID SAFETY-VALVE. Arthur L. Smyly, Chicago, Ill.

1. A heat-operated fluid safety valve comprising a movable valve member held normally in



Pneumatic Patents October 23

1,243,464. BLOWER FOR BOILERS. Glenn W. Watson, Detroit, Mich.

1,243,472. CLEANING APPARATUS. John MacNaull Wilson, Montclair, N. J.

1,243,509. MEANS FOR CONTROLLING THE OPERATION OF AIR-GAS PLANTS. John Thomas Graham, Halstead, England.

1,243,524. METHOD AND APPARATUS FOR TREATING AIR. William T. Hoofnagle, Glen Ridge, N. J.

1,243,557. AIR-PRESSURE - MAINTENANCE CHAMBER FOR AIRCRAFT. John J. Reynolds, Rantoul, Ill.

1,243,586. MECHANISM FOR OPERATING AIR - COMPRESSORS, Etc. Ira Ellsworth Brown, Fort Stockton, Tex.

1,243,592. PRESSURE AND VACUUM RELIEF VALVE. David Craig, Peabody, Mass.

OCTOBER 23.

1,243,727. AIR-BRAKE SYSTEM. William J. Fried, Fountain City, Wis.

1,243,733. FIRE-EXTINGUISHER. Benjamin M. Grieffith, Pittsburgh, Pa.

1. A portable fire extinguisher consisting of a tank provided with two chambers arranged one

open position by gravity, a spring to close said member in case of emergency only, a locking pin to restrain the spring from acting to close the valve, but permitting closure of the valve by other means, and means having a fusible body to hold said pin in its operative position.

1,244,040. CARBURETER. Micael A. Duz and Dixon E. Washington, Paris, France.

1,244,092. SUCTION - OPERATED LIQUID-FEED DEVICE. Webb Jay, Chicago, Ill.

1,244,139. CARPET-CLEANER. Angel Stathakis, Elizabeth, N. J.

1,244,293. STATIONARY FIRE-EXTINGUISHER SYSTEM. Robert L. Cooney, Atlanta, Ga.

1,244,329. OIL-BURNER. Julius C. Hinz, Detroit, Mich.

1,244,365. TIRE-PUMP. George H. Patten, Chattanooga, Tenn.

1,244,380. PROCESS OF RECOVERING SALT FROM ITS ADMIXTURE WITH IMPURITIES IN CRUDE BRINE. William W. Skinner and Walter F. Baughman, Washington, D. C.

The process of recovering chlorid of sodium from its admixture with impurities in crude

brine, particularly, the salts of barium, consisting of treating brine with sodium sulfate and calcium oxid, pumping air through the mixture thoroughly to incorporate the added substance with the brine and for the purposes of decomposing the ferrous bicarbonate naturally present in the brine, thus producing a flock of iron hydrate, which is carried down with the barium sulfate formed, and crystallizing the pure salt, sodium chlorid, out of the resultant solution, substantially as described.

1,244,427. TURBINE - DRIVEN BLOWER. Frans H. C. Coppus, Worcester, Mass.

1. In a device of the class described, the combination with a turbine, of a blower driven thereby, and having an inclosing casing, and means for delivering the exhaust steam from said turbine into the casing of said blower in a direction corresponding to the movement of air through said casing.

OCTOBER 30.

1,244,485. SOUNDING APPARATUS. Ernst G. Fischer, Washington, D. C.

1. A sounder comprising a tube closed at one end to inclose an air-spring, a cap detachably threaded to the other end of said tube, said cap having a water inlet passage to the interior of the tube, and a valve device, for closing said passage, wholly supported by said cap, said cap having ports for releasing the air while screwing the cap onto the tube.

1,244,508. VACUUM - SEALING MACHINE. Eric B. Kramer, Brooklyn, and Charles Hammer, New York, N. Y.

1,244,528. VACUUM LIGHTNING-ARRESTER. David T. May, New York, N. Y.

1,244,537. PNEUMATICALLY - CONTROLLED BLANK-TRIPPING MECHANISM FOR BLANK-FEEDING MECHANISMS. Melville E. Peters, George H. Fath, and Albert F. Miller, Denver, Colo.

1,244,631. WATER-LIFT. James Americus Mitchell, McCrory, Ark.

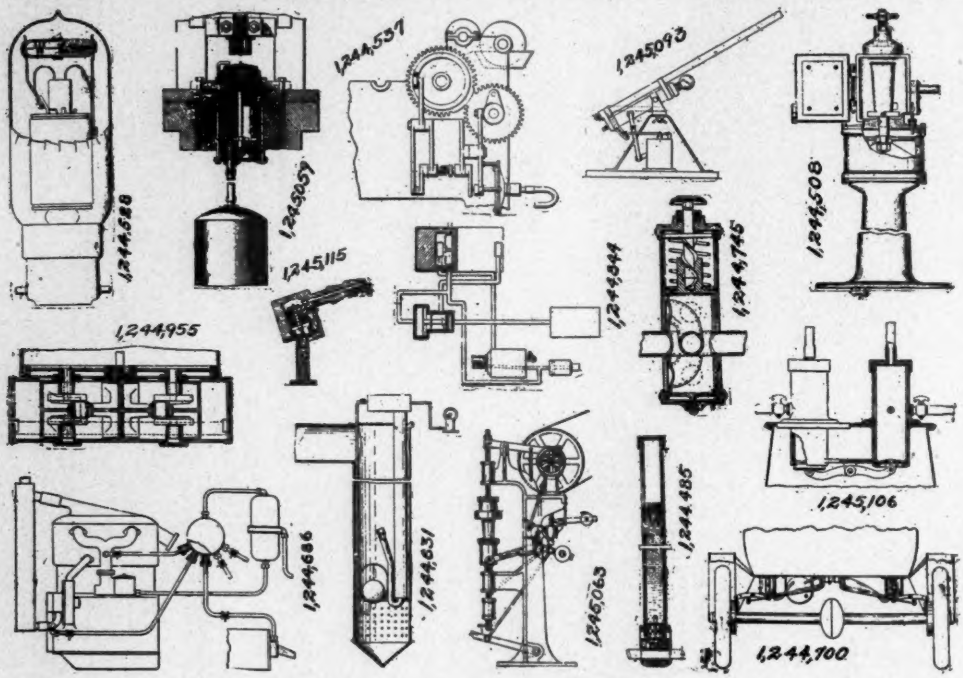
1. A water lift including a tubular member provided with an entrance opening, a partition insertible within said tubular member, a pipe secured to said partition and leading from a source of fluid under pressure, said pipe being provided with a returned extension.

1,244,686. VACUUM SYSTEM FOR INTERNAL-COMBUSTION ENGINES. Walter R. Bamford and Harry W. Hamilton, Detroit, Mich.

1,244,700. PNEUMATIC EQUALIZER FOR VEHICLES. John Loucien Chesnutt, Kansas City, Mo.

1,244,745. ROTARY AIR-VALVE FOR CORNETS OR THE LIKE. Eugene E. King, Vancouver, British Columbia, Canada.

1,244,804. STRAIGHT-AIR MECHANISM FOR AIR-BRAKES. Willis C. Webster, Dubois, Pa.



PNEUMATIC PATENTS OCTOBER 30

1,244,955. MACHINE FOR USE IN TRANSMITTING ENERGY BY MEANS OF ALTERNATELY-MOVING AIR-COLUMNS. Heinrich Christiansen, Pinneberg, Germany.

1,245,059. DIE-CUSHION. David Strand, Chicago, Ill.

1. The combination of a sheet metal shaping member, means co-operating with said member for shaping the material, and embodying gripping means for the material, a freely detachable and self contained fluid pressure means for maintaining a substantially unvarying pressure on the gripping means during the operation of shaping the material, said fluid pressure means embodying a piston and a cylinder, said piston carrying a rod extending beyond the end of the cylinder and detachably secured to the said shaping member.

1,245,063. VACUUM SEALING - MACHINE. Thomas L. Taliaferro, La Grange, Ill.

1,245,093. PNEUMATIC GUN AND SHELL-FIRING DEVICE THEREFOR. Villeroy Corney Doubleday, London, England.

1,245,106. MILKING-MACHINE. Albert C. Hougland, Madison, Wis.

1,245,115. PNEUMATIC COUPLING. Norman S. McEwen, Nashville, Tenn.

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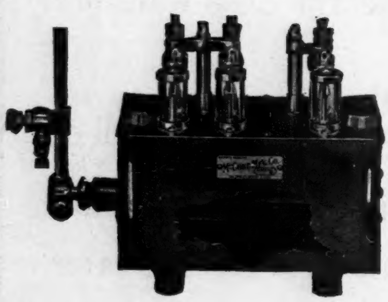

You adjust a McCord Force-Feed Lubricator at the exact amount of oil required by your engine or compressor. The oil is then measured to the last drop and delivered to the exact spot where required. This is absolute—it never varies.

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Diamond-Way opening affording minimum opening and closing. Admits a very close regulation, preventing all waste of air.

Dialed indicator insuring perfect control. Specially ground for air compressor service, guaranteed absolutely tight.

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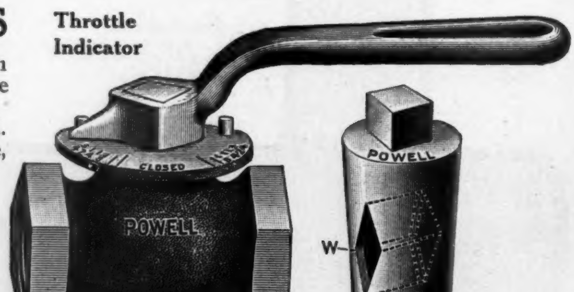
Throttle Indicator



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This actual photograph shows carbon taken from the valves of an electric air compressor. The plant superintendent was surprised that an explosion resulting in great loss of life and property had not occurred.

The lubricant also formed a heavy residue in the bottom of the lubricator, so choking it as to necessitate a thorough cleaning at least once a week.

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has put an end to lubrication troubles in this big plant, just as it has in others all over America. Too much care cannot be given to the lubrication of air compressor cylinders. Heavy oils are high in sticky carbon. Animal and vegetable oils must be entirely avoided, for they adhere to valves and passages, inviting explosions. All lubricants with low flash points must be avoided.

Actual tests prove the superiority of Keystone Grease No. 6 (light) in air cylinder lubrication. Let one of our experienced lubricatton engineers give you the FULL FACTS—and arrange for a trial installation at OUR risk.

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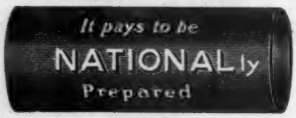
QUESTIONS SOMETIMES ASKED ABOUT

"NATIONAL" PIPE



Q—What is "NATIONAL" Pipe?
A—"NATIONAL" Pipe is welded steel pipe made in the eleven mills of National Tube Company, where all processes from the mining of the ore to the finished product are directly under the control of one organization and management.

Q—What is the range of sizes and dimensions of "NATIONAL" Pipe?
A—"NATIONAL" Pipe is made in sizes ranging from 1-8-inch up to 30- inches, inclusive, and of standard dimensions as shown in regular lists published by this Company.

Q—Does "NATIONAL" Pipe possess special advantages?
A—Yes; in briefest form the following are some of the special advantages of "NATIONAL" Pipe:

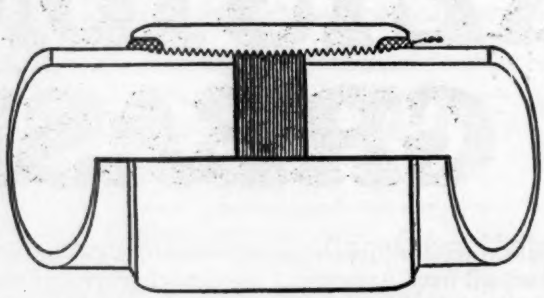
(1) Made by one organization from ore to finished product.
(2) Uniform in quality from year to year.
(3) Strong and ductile.
(4) Sizes 4-inches and under are Spellerized to resist corrosion.
(5) Full standard weight only.
(6) Sizes from 1-8-inch up to and including 30-inches.
(7) Made in lengths up to and including 40-feet.
(8) Tested with internal hydrostatic pressure beyond service requirements.
(9) Made in all weights and types suitable for every tubular service.
(10) Gives clean-cut and strong threads.
(11) Is exceptionally durable under severe service conditions.
(12) Economical in price.
(13) Is the result of fifty years of pipe manufacturing experience.
(14) Was awarded the GRAND PRIZE at the Panama-Pacific Exposition, 1915.
(15) Is **"the highest development of the art."**

Q—Noting the advantage numbered 9; is there a special type of "NATIONAL" Pipe for air lines?

A—Yes; "NATIONAL" AIR LINE PIPE, and in addition a special joint is designed for this purpose. (See illustration).

Q—The bursting strength is very important; what is the bursting strength of "NATIONAL" Pipe?

A—The bursting strength of "NATIONAL" Pipe has been determined by Professor R. T. Stewart, Dean of the College of Engineering, University of Pittsburgh, as the result of a number of experiments, and he made the following statement before the American Society of Mechanical Engineers:



Typical Section of Air Line Pipe Coupling and Joint

"BUTT-WELDED WROUGHT IRON PIPE IS 70 PER CENT. AS STRONG AS SIMILAR BUTT-WELDED STEEL PIPE; AND LAP-WELDED WROUGHT IRON PIPE IS 57 PER CENT. AS STRONG AS SIMILAR LAP-WELDED STEEL PIPE"

¶To readily identify "NATIONAL" material and as protection to manufacturer and consumer alike, the practice of National Tube Company is to roll in raised letters of good size on each few feet of every length of welded pipe the name "NATIONAL" (except on the smaller butt-weld sizes, on which this is not mechanically feasible: on these smaller butt-weld sizes the name "NATIONAL" appears on the metal tag attached to each bundle of pipe).

¶When writing specifications or ordering tubular goods, always specify "NATIONAL" pipe, and identify as indicated.

LOOK FOR THE MARK

Name Rolled in Raised Letters on National Tube Company Pipe

¶In addition, all sizes of "NATIONAL" welded pipe four in. and under are subjected to a roll-knobbling process known as Spellerizing to lessen the tendency to corrosion, especially in the form of pitting. This Spellerizing process is peculiar to "NATIONAL" pipe, to which process National Tube Company has exclusive rights.

¶"NATIONAL" pipe was awarded the GRAND PRIZE (highest possible award) at Panama Pacific International Exposition, 1915.

Q—According to this finding is "NATIONAL" Pipe more suitable for compressed air lines than other materials?

A—Satisfactory service is the best test, and "NATIONAL" AIR LINE PIPE with special air line joint has proved satisfactory for air lines in all kinds of service.

NATIONAL TUBE COMPANY, GENERAL SALES OFFICES: FRICK BUILDING, PITTSBURGH, PA.

DISTRICT SALES OFFICES: Atlanta Boston Chicago Denver New Orleans New York Philadelphia Pittsburgh St. Louis St. Paul Salt Lake City
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Hoist Everything

In the winzes, raises, prospect shafts and like places where the duty is light and the installation not permanent.

Haul Many Things

Below and above ground—pulling up inclines—lowering down slopes or hauling in and out of drifts.

Handle Anything

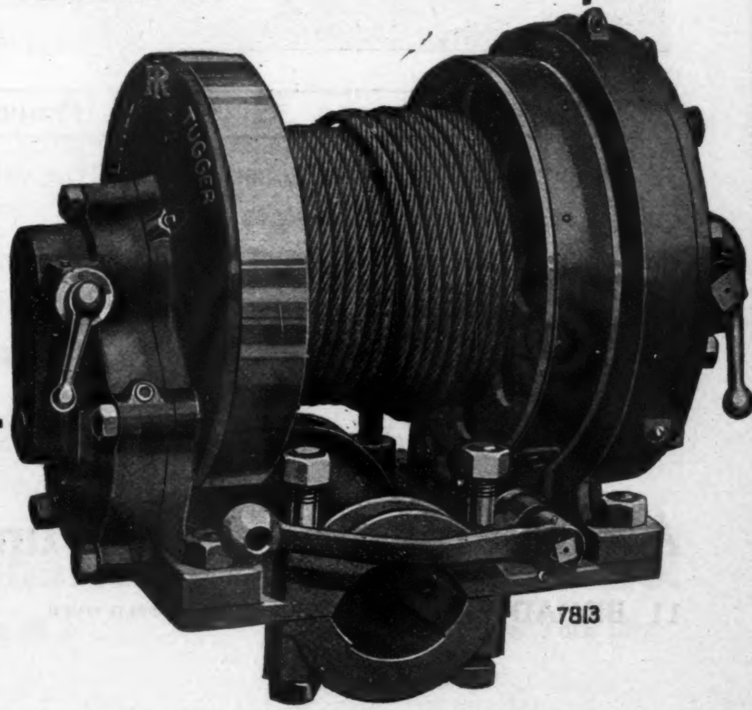
That isn't over the 1000 pound load limit, drills, mountings, buckets, supplies, muck etc.

Hang Anywhere

Clamped or bolted to any convenient drill column, pipe, timber or other handy support.

Bulletin No. 4233.

You can profitably employ Little Tugger for the jobs that have been using up your men's time.



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Stearns-Roger Mfg. Co.

Pumps, Automatic Displac'ment
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Stearns-Roger Mfg. Co.

Pumps, Steam.
Cameron Stm. Pump Wks., A. S.
Stearns-Roger Mfg. Co.

Quarry Machinery.
Bury Compressor Co.
Cameron Stm. Pump Wks., A. S.
Chicago Pneumatic Tool Co.
Hartford Contractors' Supply Co.
Ingersoll-Rand Co.
Oldham & Sons Co., Geo.
Stearns-Roger Mfg. Co.

Rock Drills, Air and Steam.
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Rock Drills, Electric-Air.
Stearns-Roger Mfg. Co.
Ingersoll-Rand Co.

Sand Blast Machinery.
Ingersoll-Rand Co.

Sand Riddling Machines.
Chicago Pneumatic Tool Co.

Stone Tools, Pneumatic.
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Oldham & Sons Co., Geo.
Stearns-Roger Mfg. Co.

Tank, Air.
Bury Compressor Co.
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Porter Co., H. K.
Wm. B. Scaife & Sons Co.

Tools, Pneumatic.
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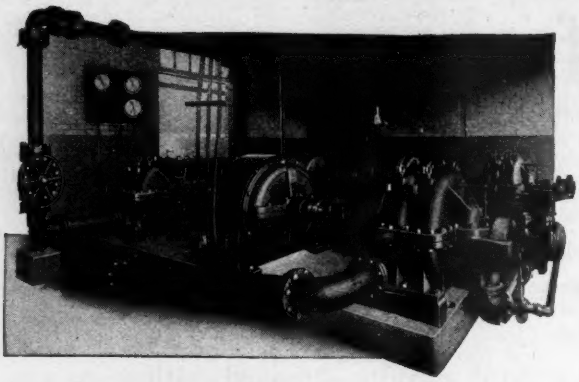
The Slogan of the Cameron: "Character: The Grandest Thing."

600 G. P. M. AGAINST 1225 FT. HEAD



This illustration shows a duplicate set of two No. 5 3-stage Cameron Class "MT" Centrifugal Pumps, direct connected, to 300 H. P. motor, giving a capacity of 600 G. P. M. against 1225 feet ahead at 1760 R. P. M. These

Cameron Centrifugals

are installed in a large steel plant. They were run continuously for several months without inspection, and gave their initial high efficiency. After replacing the packing in the Stuffing Boxes, they have been operated to date without stopping.

This is just another proof of the High Efficiency and Economy you can be sure of when you install CAMERON CENTRIFUGALS.

As shown in the lower illustration, they are very simple in design, compact and strong, with horizontally split casings, which give ready access to working parts.

Bulletin No. 7251 on Request

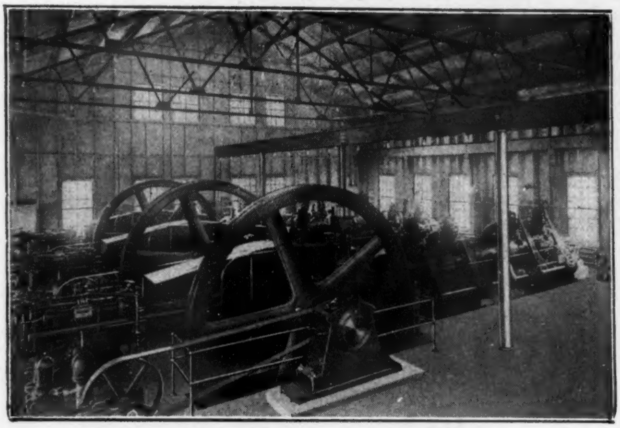
A. S. Cameron Steam Pump Works

11 BROADWAY **Offices the World Over** **NEW YORK**

12T

COOPER GAS ENGINES

FOR COMPRESSOR SERVICE



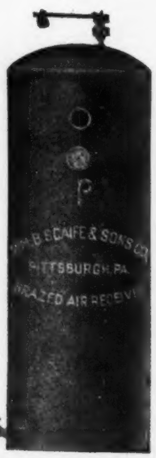
Three 480 B. H. P. Single Tandem Gas Engines direct driving Ingersoll-Rand Compressor Cylinders of the Hurricane Type, in the Spencer, W. Va., Compressor Station of the United Fuel Gas Company.

We have received four REPEAT ORDERS for duplicates of these Engines.

THE C. & G. COOPER CO., MT. VERNON OHIO

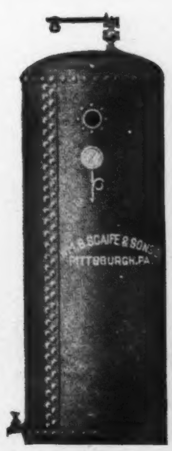
COMPRESSED AIR TANKS

ALL SIZES ALL PRESSURES FOR EVERY PURPOSE



Copper-brazed Seams and Joints, by actual tests, are proved conclusively to be stronger than any other part of the tank.

Copper-brazed Tanks should not be confused with welded tanks, or other so-called "brazed" tanks which are inferior in strength and durability.



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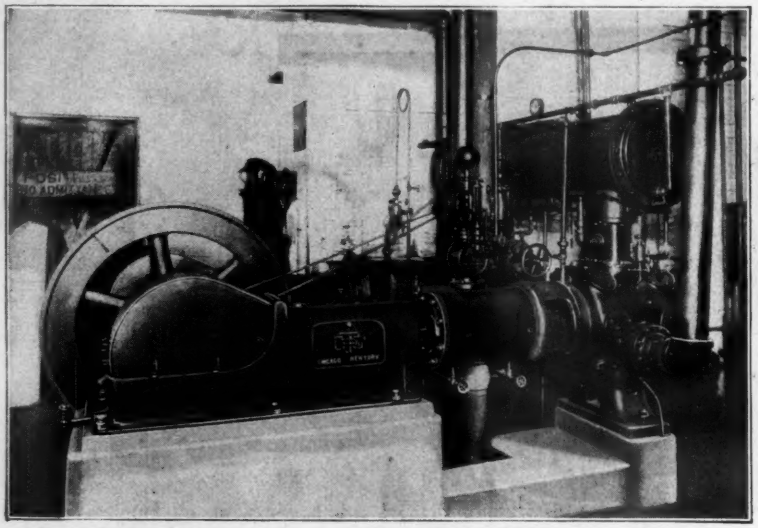
Installed at Plant of Frank McWilliams, Inc., W. New Brighton, N. Y.



This is a 10x16x15x9x10 Class O-CSC Air Compressor.

Class "O" Chicago Pneumatic Air Compressors equipped with our new two or four step control—a system of automatic regulation whereby the largest compressor may be operated economically at as low as one-fourth of its capacity—an exclusive feature of these compressors.

All "Chicago Pneumatic" compressors are equipped with the **Simplate Disc Valve,** the simplest and most efficient compressor valve yet devised, and absolutely noiseless in its operation.

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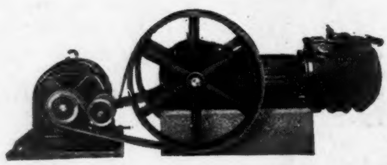
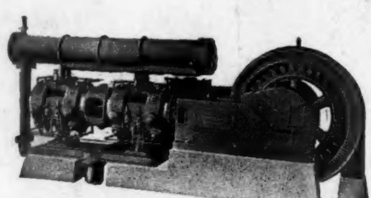


Bury Single Stage Motor Driven for Short Belt Drive with Floating Idler Pulley



Bury 2 Stage, 3 Cylinder Variable Volume Direct Connecting with Synchronous Motor on Shaft

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